Water Body Fact Sheets for 2002
Section 303(d) List Update
Lahontan Region

LAKE TAHOE HYDROLOGIC UNIT

California Regional Water Quality Control Board, Lahontan Region
2501 Lake Tahoe Boulevard
South Lake Tahoe CA 96150

November 2001

Contact Person:

Judith Unsicker
Staff Environmental Scientist
Telephone: (530) 542-5462
Email: unsij@rb6s.swrcb.ca.gov

SNOW CREEK, HABITAT ALTERATIONS
2002 Section 303(d) Fact Sheet
Delisting

Rationale for Delisting

Snow Creek was listed due the impacts on beneficial uses of fill in the wetland/riparian area near its confluence with Lake Tahoe. The creek is now recommended for delisting because a restoration project has been implemented.

The original disturbance involved partial grading of a meadow, possibly for development which never occurred, and dumping of fill by highway maintenance crews in the early 1960s. Before restoration, about 75 percent of the project area was occupied by sparsely vegetated fill. Much of the fill was contaminated with petroleum products, which were used for dust control at the time. Fill mounds up to five feet deep altered the course of the creek.

The California Tahoe Conservancy has acquired and restored the four-acre disturbed site in coordination with the Placer County Department of Public Works. About 30,000 cubic yards (2000 truckloads) of contaminated fill were hauled away. (The project's $4.2 million cost reflected the necessity for toxics cleanup.) The stream channel (950 feet) and ponds were restored. The existing constructed pond was made smaller and reconfigured as a seasonal meadow wetland. Channels were reconfigured to promote more frequent inundation of the meadow areas, and the area was revegetated with a variety of wetland and riparian plant species. In 2000, revegetation was projected to be successful within 2 years. Three new box culverts were installed under State Highway 28 to allow free fish passage and reduce flooding of the highway.

Watershed Characteristics

Snow Creek (Hydrologic Unit No. 634.20, latitude 39.240^{o}N, longitude 120.050^{o}W) is a tributary to Lake Tahoe on its north shore. The disturbed wetland/riparian area is adjacent to State Highway 28 in the community of Tahoe Vista. The main creek channel is 3.66 miles long, and the watershed area is 4.49 square miles.

Information Sources

California Regional Water Quality Control Board, Lahontan Region, 1995. *Water Quality Control Plan for the Lahontan Region.*

California Regional Water Quality Control Board, Lahontan Region, 2001. *Staff Report on Recommended Changes to Lahontan Region's Section 303(d) List of Impaired Surface Water Bodies.*

DeLong, Jeff, 2000. Larger Wetlands Project is Set for Lake Tahoe. *Reno Gazette-Journal,/RGJ.com*, Sunday October 15, 2000.

Erlich, Robert, Lahontan Regional Board staff, personal communication, October 2001 .

Tahoe Regional Planning Agency, 1999. *Annual Water Quality Report.*

LAKE TAHOE, SEDIMENT, NITROGEN, PHOSPHORUS
2002 Section 303(d) Fact Sheet
Clarification of Existing Listing

Summary of Proposed Action

Lake Tahoe is currently Section 303(d) listed for nutrients and sediment. For clarity, the listing for "nutrients" is proposed to be replaced by separate listings for nitrogen and phosphorus. As noted below, other water quality standards are being violated as a result of increased sediment and nutrient loading. However, violations of these standards result from sediment and nutrient problems, and no separate new listings are proposed.

Watershed Characteristics

Lake Tahoe has a surface area of 192 square miles (120,000 acres), and its watershed area is 314 square miles. The lake has an average depth of 1027 feet, a maximum depth of 1646 feet, and 72 miles of shoreline. Because of its large volume, Lake Tahoe has a water residence time of 700 years. Lake Tahoe has 63 tributary streams, and these in turn have smaller streams and lakes at their headwaters. (There are more than 170 lakes and ponds in the Lake Tahoe watershed as a whole.) In addition, small "intervening areas" between streams contribute runoff directly to the lake. About two thirds of the watershed is in California (in Placer, El Dorado, and Alpine Counties) and one third in Nevada. About 75 percent of the watershed is in public ownership; most development on private lands has occurred near the lake. The only outflow from Lake Tahoe is to the Truckee River. The lake is managed as a reservoir, with the upper six feet under control of a federal watermaster; the effective storage capacity is 745,000 acre feet.

Lake Tahoe is known for its extraordinary clarity (historic Secchi depth up to 120 feet) and deep blue color. It is a recreational attraction because of its scenic quality and the availability of summer and winter outdoor activities and casino gaming in Nevada. Because of its high ecological and recreational value, Lake Tahoe is a designated "Outstanding National Resource Water" in which no long term degradation can be permitted.

Water Quality Objectives Not Attained

Lake Tahoe is considered to be an oligotrophic (low productivity) lake. It still has relatively low concentrations of nitrogen and phosphorus in spite of increased nutrient loading since the mid-20th Century, and water quality objectives for these parameters are not being violated. Lake Tahoe was historically nitrogen limited, but increased atmospheric nitrogen loading has led to phosphorus limitation. (Both nutrients are still considered important.) Because suspended sediment is affecting beneficial uses, the lake can be considered to be in violation of the regionwide narrative suspended sediment and suspended materials objectives. Sediment is of concern not only for its direct impacts, but also because it carries particulate nutrients into the lake. Iron is of concern as a nutrient in Lake Tahoe and its tributaries, and several tributaries are recommended to be listed for iron in 2002. There is insufficient information about the role of iron in Lake Tahoe to justify listing the lake for iron at this time.

Lake Tahoe has violations, or threatened violations, of a number of other narrative water quality objectives which are indicators of increased nutrient loading, including the following:

Nondegradation
Algal Growth Potential
Biostimulatory Substances
Biological indicators (algal productivity and phytoplankton, zooplankton, and periphyton biomass)
Clarity
Plankton Counts
Transparency

The most frequently measured indicators of compliance with these objectives are transparency and phytoplankton productivity. The water quality objectives for these parameters are set at levels measured between 1967 and 1971. Transparency (measured as Secchi depth) has decreased 30 percent, and phytoplankton productivity has increased almost 300 percent, since 1968.

Beneficial uses of Lake Tahoe are also being affected. Increased productivity and sediment loading, and decreased transparency are affecting the aesthetic enjoyment component of the Non-Contact Water Recreation beneficial use. Changes in nutrient loading may also be contributing to impairment of aquatic life uses. For example, the Tahoe benthic stonefly, a species found only in Lake Tahoe, depends on deep water plant beds which could be shaded out by significantly more turbid waters. By changing aquatic habitat conditions, increased pollutant loading may also favor the invasion of exotic plant and animal species.

It is not feasible to develop a TMDL for each parameter covered in the narrative objectives listed above. (For example, one cannot allocate loads or wasteloads of “transparency.”) These violations are clearly the result of increased loading of sediment and nutrients, and their attainment can best be ensured through development of TMDLs for sediment, nitrogen, and phosphorus.

Extent of Impairment

The entire lake is Section 303(d) listed.

Potential Sources

The sources of sediment and nutrient loading to Lake Tahoe include erosion from past and present watershed disturbance, stormwater, and other nonpoint sources including urban fertilizer use and past wastewater disposal to land. (Wastewater is currently exported from the watershed for disposal.) Atmospheric deposition is an important source of nutrient loading. Another watershed problem affecting sediment and nutrient loading has been the widespread development and disturbance of wetland and riparian areas that formerly helped to filter out sediment and nutrients before they entered the lake.

TMDL Priority

Lake Tahoe has a high priority for TMDL development. Work on the TMDL has already begun, and it is currently scheduled for completion (through Regional Board action) in 2007.

Information Sources

California Regional Water Quality Control Board, Lahontan Region, 1995. *Water Quality Control Plan for the Lahontan Region.*

California Regional Water Quality Control Board, Lahontan Region, 2001. *Staff Report on Recommended Changes to Lahontan Region's Section 303(d) List of Impaired Surface Water Bodies.*

Murphy, D.M., and C.M. Knopp, editors, 2000. *Lake Tahoe Watershed Assessment.* Gen. Tech. Rep. PSW-GTR-176, USDA Forest Service, Pacific Southwest Research Station, Albany, CA, Vols. I and II.

Tahoe Regional Planning Agency, 1999. *Annual Water Quality Report.*

BLACKWOOD CREEK, NITROGEN
2002 Section 303(d) Fact Sheet
Listing

Summary of Proposed Action

Blackwood Creek, a tributary of Lake Tahoe, is currently listed for sediment. An additional listing for nitrogen is recommended.

Table 1. 303(d) Listing/TMDL Information

Waterbody Name	Blackwood Creek	**Pollutant(s)**	Nitrogen
Hydrologic Unit	Lake Tahoe (634.20)	**Sources**	Atmospheric deposition, erosion, stormwater
Total Length	6.20 miles	**TMDL Priority**	High
Size Affected	6.20 miles	**TMDL End Date**	After 2015
Latitude/Longitude	39.108^{o} N, 120.157^{o} W	**Original 303(d) Listing Year**	2002

Watershed Characteristics

Blackwood Creek, in Placer County, is tributary to Lake Tahoe on its northwest shore. It enters the lake near the small communities of Tahoe Pines and Idlewild. It has a total watershed area of 11.2 square miles and a main channel length of 6.20 miles. There are five small tributaries. Between 1993 and 1996, the annual average runoff was estimated at 31,800 acre feet and the average annual mean daily streamflow at 44.0 cubic feet per second (cfs). Most of the watershed is now in U.S. Forest Service ownership. Barker Pass Road runs as a paved road near the creek for much of its length; the Pacific Crest Trail crosses the headwaters. Blackwood Creek's watershed was severely disturbed in the past by activities such as logging and gravel mining.

Water Quality Objectives Not Attained

Blackwood Creek is in violation of the numerical water quality objective for total nitrogen, 0.19 milligrams per liter (mg/L) as an annual mean.

Evidence of Impairment

Data from the Lake Tahoe Interagency Monitoring Program (LTIMP) reported in TRPA (1999), show that, on an annual mean basis, the total nitrogen objective was violated in Blackwood Creek in 6 of 8 years between Water Years 1989 and 1996. Annual average concentrations ranged from 0.103 mg/L in 1994 to 0.293 mg/L in 1995. The range of single value concentrations for total

Kjeldahl nitrogen (ammonia plus organic nitrogen) reported by Rowe (1998) for the LTIMP period of record (through 1996) was 0.02-1.7 mg/L, with a median value of 0.13 mg/L. The range of single value concentrations for nitrate plus nitrate was 0.002-0.086 mg/L, with a median value of 0.016 mg/L.

Extent of Impairment

LTIMP samples are collected near the mouth of Blackwood Creek. The entire creek (main channel length 6.20 miles) is proposed for listing.

Potential Sources

Atmospheric deposition, erosion due to past and present watershed disturbance, stormwater.

TMDL Priority

Because of its importance in nutrient loading to Lake Tahoe, Blackwood Creek is recommended to be ranked "high" priority for development of a nitrogen TMDL. Nutrient loading from the Blackwood Creek watershed will be addressed during development of the Lake Tahoe TMDL; if a more specific nitrogen TMDL is needed, if will be completed after 2015.

Information Sources:

California Regional Water Quality Control Board, Lahontan Region, 1995. *Water Quality Control Plan for the Lahontan Region.*

California Regional Water Quality Control Board, Lahontan Region, 2001. *Staff Report on Recommended Changes to Lahontan Region's Section 303(d) List of Impaired Surface Water Bodies.*

Murphy, D.M., and C.M. Knopp, editors, 2000. *Lake Tahoe Watershed Assessment.* Gen. Tech. Rep. PSW-GTR-176, USDA Forest Service, Pacific Southwest Research Station, Albany, CA, Vols. I and II.

Rowe, T.G., 1998. *Loads and Yields of Sediment and Nutrients for Selected Watersheds in the Lake Tahoe Basin, California and Nevada.* U.S. Geological Survey, paper presented at Water Quality Monitoring Council 1998 Conference. Available on the Internet: http://204.87.241.11/98proceedings/Papers/50-ROWE.html.

Rowe, T.G., 2001. Loads and Yields of Suspended Sediment for Selected Watersheds in the Lake Tahoe Basin, California and Nevada. *Proceedings of the Seventh Federal Interagency Sedimentation Conference*, March 25 to 29, 2001, Reno Nevada.

Tahoe Regional Planning Agency, 1999. *Annual Water Quality Report.*

BLACKWOOD CREEK, PHOSPHORUS
2002 Section 303(d) Fact Sheet
Listing

Summary of Proposed Action

Blackwood Creek, a tributary of Lake Tahoe, is currently listed for sediment. An additional listing for phosphorus is recommended.

Table 1. 303(d) Listing/TMDL Information

Waterbody Name	Blackwood Creek	**Pollutant(s)**	Phosphorus
Hydrologic Unit	Lake Tahoe (634.20)	**Sources**	Atmospheric deposition, erosion, stormwater, forest fire
Total Length	6.20 miles	**TMDL Priority**	High
Size Affected	6.20 miles	**TMDL End Date**	After 2015
Latitude/Longitude	39.108^{o} N, 120.157^{o} W	**Original Listing Year**	2002

Watershed Characteristics

Blackwood Creek, in Placer County, is tributary to Lake Tahoe on its northwest shore. It enters the lake near the small communities of Tahoe Pines and Idlewild. It has a total watershed area of 11.2 square miles and a main channel length of 6.20 miles. There are five small tributaries. Between 1993 and 1996, the annual average runoff was estimated at 31,800 acre feet and the average annual mean daily streamflow at 44.0 cubic feet per second (cfs). Most of the watershed is now in U.S. Forest Service ownership. Barker Pass Road runs as a paved road near the creek for much of its length; the Pacific Crest Trail crosses the headwaters. Blackwood Creek's watershed was severely disturbed in the past by activities such as logging and gravel mining along the central reaches of the stream.

Water Quality Objectives Not Attained

Blackwood Creek is in violation of the numerical water quality objective for total phosphorus, 0.015 milligrams per liter (mg/L), as an annual mean.

Evidence of Impairment

Lake Tahoe Interagency Monitoring Program (LTIMP) data summarized by the Tahoe Regional Planning Agency (1999) show that annual mean concentrations of total phosphorus violated the objective in 15 of 17 water years from 1980 to 1996. The Water Year 1996 mean concentration was 0.126 mg/L. Rowe (1998) cites a concentration range during the LTIMP period of record (through 1996) of 0.010 to 0.994 mg/L, with a median value of 0.031 mg/L total phosphorus.

Extent of Impairment

LTIMP samples are collected near the mouth of Blackwood Creek. The entire creek (main channel length 6.20 miles) is proposed for listing.

Potential Sources

Atmospheric deposition (including particulate phosphorus from forest fires), erosion due to past and present watershed disturbance, stormwater.

TMDL Priority

Because of its importance in nutrient loading to Lake Tahoe, Blackwood Creek is recommended to be ranked "high" priority for development of a phosphorus TMDL. Phosphorus loading from the Blackwood Creek watershed will be addressed during development of the Lake Tahoe TMDL; if a more specific phosphorus TMDL is needed, it will be completed after 2015.

Information Sources:

California Regional Water Quality Control Board, Lahontan Region, 1995. *Water Quality Control Plan for the Lahontan Region.*

California Regional Water Quality Control Board, Lahontan Region, 2001. *Staff Report on Recommended Changes to Lahontan Region's Section 303(d) List of Impaired Surface Water Bodies.*

Murphy, D.M., and C.M. Knopp, editors, 2000. *Lake Tahoe Watershed Assessment.* Gen. Tech. Rep. PSW-GTR-176, USDA Forest Service, Pacific Southwest Research Station, Albany, CA, Vols. I and II.

Rowe, T.G., 1998. *Loads and Yields of Sediment and Nutrients for Selected Watersheds in the Lake Tahoe Basin, California and Nevada.* U.S. Geological Survey, paper presented at Water Quality Monitoring Council 1998 Conference. Available on the Internet: <http://204.87.241.11/98proceedings/Papers/50-ROWE.html> .

Tahoe Regional Planning Agency, 1999. *Annual Water Quality Report.*

BLACKWOOD CREEK, IRON
2002 Section 303(d) Fact Sheet
Listing

Summary of Proposed Action

Blackwood Creek, a tributary of Lake Tahoe, is currently listed for sediment. An additional listing for iron is proposed.

Table 1. 303(d) Listing/TMDL Information

Waterbody Name	Blackwood Creek	**Pollutant(s)**	Iron
Hydrologic Unit	Lake Tahoe (634.20)	**Sources**	Erosion, stormwater
Total Length	6.20 miles	**TMDL Priority**	Medium
Size Affected	6.20 miles	**TMDL End Date**	After 2015
Latitude/Longitude	39.108^{o} N, 120.157^{o} W	**Original Listing Year**	2002

Watershed Characteristics

Blackwood Creek, in Placer County, is tributary to Lake Tahoe on its northwest shore. It enters the lake near the small communities of Tahoe Pines and Idlewild. It has a total watershed area of 11.2 square miles and a main channel length of 6.20 miles. There are five small tributaries. Between 1993 and 1996, the annual average runoff was estimated at 31,800 acre feet and the average annual mean daily streamflow at 44.0 cfs. Most of the watershed is now in U.S. Forest Service ownership. Barker Pass Road runs as a paved road near the creek for much of its length; the Pacific Crest Trail crosses the headwaters. Blackwood Creek's watershed was severely disturbed in the past by activities such as logging and gravel mining along the central reaches of the stream.

Water Quality Objectives Not Attained

Blackwood Creek is in violation of the numerical water quality objective for total iron (0.03 milligrams per liter [mg/L], annual mean).

Evidence of Impairment

Lake Tahoe Interagency Monitoring Program (LTIMP) data summarized by the Tahoe Regional Planning Agency show that annual mean iron concentrations violated the objective every year from Water Year 1989 to Water Year 1996. LTIMP data summarized by Rowe (1998) shows a range of iron concentrations during the period of record (through 1996) from 103 to 14,800 mg/L, with a median concentration of 440 mg/L. (Rowe expresses iron concentrations in micrograms per liter [ug/L] in the text of his report, and the use of mg/L in his summary table is probably a typographical error.)

Iron is measured in the LTIMP as "total biologically available iron (BaFe)" or "total bioreactive iron." It is monitored because of its importance as a plant nutrient. Water quality objectives for iron in tributaries of Lake Tahoe were based on limited data collected before 1980 and probably do not reflect natural background concentrations.

Extent of Impairment

LTIMP samples are collected near the mouth of Blackwood Creek. The entire creek (main channel length 6.20 miles) is proposed for listing.

Potential Sources

Iron is naturally present in soils of the Blackwood Creek watershed. Loading of iron to the creek has probably increased over natural background levels due to watershed disturbance.

TMDL Priority

A high priority is recommended for this TMDL. However, due to other recommended priorities, the TMDL is not projected to be completed until after 2015. Revision of water quality objectives for iron in tributaries of Lake Tahoe may be considered before that date.

Information Sources:

California Regional Water Quality Control Board, Lahontan Region, 1995. *Water Quality Control Plan for the Lahontan Region.*

California Regional Water Quality Control Board, Lahontan Region, 2001. *Staff Report on Recommended Changes to Lahontan Region's Section 303(d) List of Impaired Surface Water Bodies.*

Murphy, D.M., and C.M. Knopp, editors, 2000. *Lake Tahoe Watershed Assessment.* Gen. Tech. Rep. PSW-GTR-176, USDA Forest Service, Pacific Southwest Research Station, Albany, CA, Vols. I and II.

Rowe, T.G., 1998. *Loads and Yields of Sediment and Nutrients for Selected Watersheds in the Lake Tahoe Basin, California and Nevada.* U.S. Geological Survey, paper presented at Water Quality Monitoring Council 1998 Conference. Available on the Internet: http://204.87.241.11/98proceedings/Papers/50-ROWE.html.

Tahoe Regional Planning Agency, 1999. *Annual Water Quality Report.*

HEAVENLY VALLEY CREEK, SEDIMENT
2002 Section Section 303(d) Fact Sheet
Listing

Summary of Proposed Action

The segment of Heavenly Valley Creek between the National Forest boundary and the confluence with Trout Creek is proposed to be listed for sediment. (A sediment TMDL has been completed for the upper reach of the creek.)

Table 1. 303(d) Listing/TMDL Information

Waterbody Name	Heavenly Valley Creek	**Pollutant(s)**	Sediment
Hydrologic Unit	Lake Tahoe (634.10)	**Sources**	Upstream erosion
Total Length	3 miles	**TMDL Priority**	Medium
Size Affected	1 mile	**TMDL End Date**	After 2015
Latitude/Longitude	38.924 ^{o}N, 119.916^{o} W	**Original Listing Year**	2002

Watershed Characteristics

Heavenly Valley Creek, in El Dorado County, is a tributary of Trout Creek. Soils are derived from granitic parent materials. Its upper watershed, with a steep gradient, has been extensively disturbed by ski resort development. The lower reach flows through an urban area before joining Trout Creek. The watershed includes an area used for disposal of secondary wastewater effluent by the South Tahoe Public Utility District until 1968. The creek receives surface runoff from Pioneer Trail (a major thoroughfare) and urban development in the watershed.

Water Quality Objectives Not Attained

Although a numerical suspended sediment objective applies to all tributaries of Lake Tahoe, monitoring data are not available for this reach to determine compliance. Bedload sediment from the upstream reach has probably impacted benthic habitat uses and thus violated the narrative water quality objectives for sediment and settleable materials, which reference protection of beneficial uses.

Evidence of Impairment

As of 1996, the lower reach of Heavenly Valley Creek was rated as “marginal” fish habitat by the Tahoe Regional Planning Agency (TRPA). The TRPA’s Environmental Improvement Program includes a project (#404) for stream habitat restoration. The project, with an estimated cost of $50,000, would involve stabilization of the banks of Heavenly Valley Creek through revegetation at Pioneer Trial and 0.5 miles above and below. Completion of this project, tentatively scheduled for 2004, is expected to restore this segment to “good” fish habitat condition. The project summary notes that further assessment is needed.

Suspended sediment is not routinely monitored within this segment of Heavenly Valley Creek. Monitoring at the U.S. Forest Service Property Line station indicates that erosion control measures implemented since 1991 are having an effect and that the upper reach of the creek is approaching

attainment of the suspended sediment objective (60 milligrams per liter [mg/L] as an annual 90th percentile level). U.S. Forest Service monitoring of changes in stream cross sections also indicates that large "slugs" of bedload sediment have moved downstream in the past. This sediment is presumed to have affected instream uses of the lower reaches of Heavenly Valley Creek.

Extent of Impairment

The segment proposed for listing is about 1 mile long.

Potential Sources

The major source of sediment is upstream watershed disturbance at the Heavenly Ski Resort. This segment of the creek is also affected by local streambank erosion , by stormwater from Pioneer Trail and other nonpoint sources.

TMDL Priority

This TMDL is recommended for a medium priority, with completion projected to occur after 2015. If the Tahoe Regional Planning Agency's proposed restoration project is successful, delisting of this segment may be feasible.

Information Sources

California Regional Water Quality Control Board, Lahontan Region, 1995. *Water Quality Control Plan for the Lahontan Region.*

California Regional Water Quality Control Board, Lahontan Region, 2001. *Staff Report on Recommended Changes to Lahontan Region's Section 303(d) List of Impaired Surface Water Bodies.*

Tahoe Regional Planning Agency, 1996. *Draft 1996 Evaluation Report: Environmental Threshold Carrying Capacities and the Regional Plan Package for the Lake Tahoe Region,* December 1996.

Tahoe Regional Planning Agency, 1998. *Environmental Improvement Program for the Lake Tahoe Region.* Draft for Initial Adoption.

U.S. Forest Service, Lake Tahoe Basin Management Unit, 1998. *Heavenly Ski Resort 1997 Environmental Monitoring Report.*

U.S. Forest Service, Lake Tahoe Basin Management Unit, 1999. *Heavenly Ski Resort 1998 Environmental Monitoring Report.*

HEAVENLY VALLEY CREEK, CHLORIDE
2002 Section 303(d) Fact Sheet
Listing

Summary of Proposed Action

Heavenly Valley Creek is proposed to be listed for chloride. (A sediment TMDL for a different segment of Heavenly Valley Creek is currently awaiting final approvals.) Available data indicate that the standards violation is probably due mostly to background sources and that revision of water quality objectives may be more appropriate than TMDL development.

Table 1. 303(d) Listing/TMDL Information

Waterbody Name	Heavenly Valley Creek	**Pollutant(s)**	Chloride
Hydrologic Unit	Lake Tahoe (634.10)	**Sources**	Natural background, past wastewater disposal to land, road salt
Total Length	3 miles	**TMDL Priority**	Low
Size Affected	3 mile	**TMDL End Date**	After 2015
Latitude/Longitude	38.924 ^{o}N, 119.916^{o} W	**Original Listing Year**	2002

Watershed Characteristics

Heavenly Valley Creek, in El Dorado County, is a tributary of Trout Creek. Soils are derived from granitic parent materials. Its upper watershed, with a steep gradient, has been extensively disturbed by ski resort development. The lower reach flows through an urban area before joining Trout Creek. The watershed includes an area used for disposal of secondary wastewater effluent by the South Tahoe Public Utility District until 1968. The creek receives surface runoff from Pioneer Trail (a major thoroughfare) and urban development in the watershed.

Water Quality Objectives Not Attained

Numerical water quality objectives for Trout Creek apply upstream to its tributaries. The chloride objectives for Trout Creek are an annual mean of 0.15 milligrams per liter (mg/L) and 0.20 mg/L as a 90th percentile value.

Evidence of Impairment

Chloride data for Heavenly Valley Creek are summarized in Table 2. Data collected by the U.S. Forest Service, Lake Tahoe Basin Management Unit, for the upper reaches of Heavenly Valley Creek (and for another tributary of Trout Creek with an undisturbed watershed) show violations of the water quality objective at all stations.

Table 2. Chloride Concentrations in Heavenly Valley Creek and a reference stream (Hidden Valley Creek)

Station	Year	Annual Mean	Range	Source of Data
Undisturbed Tributary of Heavenly Valley Creek (HVC-1)	1997	0.4 mg/L	0.1-1.3 mg/L	USFS/LTBMU
Undisturbed Tributary of Heavenly Valley Creek (HVC-1)	1998	0.4 mg/L	0.1-1.4 mg/L	USFS/LTBMU
Heavenly Valley Creek at Sky Meadows (HVC-1A)	1997	0.5 mg/L	0.1-1.4 mg/L	USFS/LTBMU
Heavenly Valley Creek at Sky Meadows (HVC-1A)	1998	0.5 mg/L	0.3-1.1 mg/L	USFS/LTBMU
Heavenly Valley Creek below Patsy's Chair (HVC-2)	1997	0.6 mg/L	0.1-1.4 mg/L	USFS/LTBMU
Heavenly Valley Creek below Patsy's Chair (HVC-2)	1998	1.3 mg/L	0.1-3.2 mg/L	USFS/LTBMU
Heavenly Valley Creek at Property Line (HVC-3)	1997	0.6 mg/L	0.1-1.9 mg/L	USFS/LTBMU
Heavenly Valley Creek at Property Line (HVC-3)	1998	0.8 mg/L	0.4-1.4 mg/L	USFS/LTBMU
Heavenly Valley Creek below Pioneer Trail	2000-2001	1.2 mg/L	0.7-1.8 mg/L	South Tahoe PUD
Hidden Valley Creek (43-H5)	1997	0.4 mg/L	0.1-1.0	USFS/LTBMU
Hidden Valley Creek (43-H5)	1998	0.4 mg/L	0.1- 1.0	USFS/LTBMU

Extent of Impairment

The entire creek is recommended for listing.

Potential Sources

Because the objective is exceeded at stations with undisturbed watersheds (HVC-1 and Hidden Valley Creek), the major source of chloride is probably atmospheric deposition. The LTBMU noted that chloride concentrations increased in developed portions of the ski resort. This might possibly be due to past use of salt for snow conditioning on ski runs.

In the lower watershed, chloride could be contributed from a former wastewater disposal area near Pioneer Trail, and from salt use for deicing on roads and driveways. Other possible sources are livestock and pet wastes, and urban fertilizer use.

TMDL Priority

This TMDL is recommended for a low priority, with completion projected to occur after 2015. The water quality objective for Trout Creek is based on limited data collected before 1980. (Chloride is not routinely monitored as part of the current Lake Tahoe Interagency Monitoring Program.) The data in Table 2 for stations with undisturbed watersheds indicate that the main source of chloride is probably atmospheric deposition. Chloride at these concentrations is probably not harmful to aquatic life uses. The Regional Board may consider updating chloride objectives for waters of the Lake Tahoe Basin based on current data as an alternative to development of a TMDL. Efforts to control the impacts of deicing chemicals, including road salt, on water quality in the Lake Tahoe Basin are part of the ongoing nonpoint source control program.

Information Sources

California Regional Water Quality Control Board, Lahontan Region, 1995. *Water Quality Control Plan for the Lahontan Region.*

California Regional Water Quality Control Board, Lahontan Region, 2001. *Staff Report on Recommended Changes to Lahontan Region's Section 303(d) List of Impaired Surface Water Bodies.*

Murphy, D.M., and C.M. Knopp, editors, 2000. *Lake Tahoe Watershed Assessment.* Gen. Tech. Rep. PSW-GTR-176, USDA Forest Service, Pacific Southwest Research Station, Albany, CA, Vols. I and II.

South Tahoe Public Utility District, 2000-2001. Monitoring Data for Heavenly Valley Creek (in Regional Board files).

U.S. Forest Service, Lake Tahoe Basin Management Unit, 1998. *Heavenly Ski Resort 1997 Environmental Monitoring Report.*

U.S. Forest Service, Lake Tahoe Basin Management Unit, 1999. *Heavenly Ski Resort 1998 Environmental Monitoring Report.*

HEAVENLY VALLEY CREEK, PHOSPHORUS
2002 Section 303(d) Fact Sheet
Listing

Summary of Proposed Action

The segment of Heavenly Valley Creek within National Forest boundaries is proposed to be listed for phosphorus.

Table 1. 303(d) Listing/TMDL Information

Waterbody Name	Heavenly Valley Creek	**Pollutant(s)**	Phosphorus
Hydrologic Unit	Lake Tahoe (634.10)	**Sources**	Erosion, stormwater
Total Length	3 miles	**TMDL Priority**	High
Size Affected	3 mile	**TMDL End Date**	After 2015
Latitude/Longitude	38.924 ^{o}N, 119.916^{o} W	**Original Listing Year**	2002

Watershed Characteristics

Heavenly Valley Creek, in El Dorado County, is a tributary of Trout Creek. Its upper watershed, with a steep gradient, has been extensively disturbed by ski resort development. (A sediment TMDL has been completed for this reach.) The lower reach flows through an urban area before joining Trout Creek. Soils are derived from granitic parent materials. The watershed includes an area used for disposal of secondary wastewater effluent by the South Tahoe Public Utility District until 1968. The creek receives surface runoff from Pioneer Trail (a major thoroughfare) and other paved streets and driveways.

Water Quality Objectives Not Attained

Numerical water quality objectives for Trout Creek apply upstream to its tributaries. The total phosphorus objective for Trout Creek is 0.015 milligrams per liter (mg/L) as an annual mean.

Evidence of Impairment

Table 2 summarizes monitoring data collected by the U.S. Forest Service, Lake Tahoe Basin Management Unit (LTBMU), for several stations on Heavenly Valley Creek within National Forest boundaries, and for Hidden Valley Creek, a nearby reference stream. Recent phosphorus data are not available for the segment of the creek between the National Forest property line and the confluence with Trout Creek.

Table 2. Total Phosphorus Data for Heavenly Valley Creek

Station	Year	Annual Mean (mg/L)	Range (mg/L)	Source of Data
Undisturbed Tributary of Heavenly Valley Creek (HVC-1)	1997	0.026	0.010-0.050	USFS/LTBMU
Undisturbed Tributary of Heavenly Valley Creek (HVC-1)	1998	0.029	0.018-0.055	USFS/LTBMU
Heavenly Valley Creek at Sky Meadows (HVC-1A)	1997	0.019	0.005-0.040	USFS/LTBMU
Heavenly Valley Creek at Sky Meadows (HVC-1A)	1998	0.021	0.008-0.055	USFS/LTBMU
Heavenly Valley Creek below Patsy's Chair (HVC-2)	1997	0.021	0.008-0.037	USFS/LTBMU
Heavenly Valley Creek below Patsy's Chair (HVC-2)	1998	0.054	0.011-0.195	USFS/LTBMU
Heavenly Valley Creek at Property Line (HVC-3)	1997	0.021	0.012-0.045	USFS/LTBMU
Heavenly Valley Creek at Property Line (HVC-3)	1998	0.034	0.010-0.090	USFS/LTBMU
Heavenly Valley Creek below Pioneer Trail				STPUD
Hidden Valley Creek (43-H5)	1997	0.021	0.012-0.030	USFS/LTBMU
Hidden Valley Creek (43-H5)	1998	0.027	0.018-0.048	USFS/LTBMU

Potential Sources

Table 2 shows that violations of the phosphorus objective occur even at stations with undisturbed watersheds. The phosphorus at these stations presumably comes from natural geologic sources and/or from atmospheric deposition (from sources such as road dust, windblown soil, and ash from forest fires, wood stoves, etc.). Additional phosphorus loading may occur at some stations from accelerated erosion due to watershed disturbance.

TMDL Priority

This TMDL is recommended for high priority. It may be coordinated with development of a phosphorus TMDL for Trout Creek. TMDL completion is projected to occur after 2015. The Regional Board may also consider revision of the phosphorus objective.

Information Sources

California Regional Water Quality Control Board, Lahontan Region, 1995. *Water Quality Control Plan for the Lahontan Region.*

California Regional Water Quality Control Board, Lahontan Region, 2001. *Staff Report on Recommended Changes to Lahontan Region's Section 303(d) List of Impaired Surface Water Bodies.*

U.S. Forest Service, Lake Tahoe Basin Management Unit, 1998. *Heavenly Ski Resort 1997 Environmental Monitoring Report.*

U.S. Forest Service, Lake Tahoe Basin Management Unit, 1999. *Heavenly Ski Resort 1998 Environmental Monitoring Report.*

HIDDEN VALLEY CREEK, CHLORIDE
2002 Section 303(d) Fact Sheet
Listing

Summary of Proposed Action

Hidden Valley Creek, a tributary of Trout Creek in the Lake Tahoe Basin, is proposed to be listed for violation of the water quality objective for chloride. Since the watershed of Hidden Valley Creek is undisturbed, the chloride presumably comes from natural background sources, and revision of the water quality objective may be more appropriate than development of a TMDL.

Table 1. 303(d) Listing/TMDL Information

Waterbody Name	Hidden Valley Creek	**Pollutant(s)**	Chloride
Hydrologic Unit	Lake Tahoe (634.10)	**Sources**	Natural background, atmospheric deposition
Total Length	2.95 miles	**TMDL Priority**	Low
Size Affected	2.95 miles	**TMDL End Date**	After 2015
Latitude/Longitude	38.858^{o}N, 119.899^{o}W	**Original Listing Year**	2002

Watershed Characteristics

"Hidden Valley Creek" is not an official geographic name. It is the name used by U.S. Forest Service, Lake Tahoe Basin Management Unit (LTBMU) staff for an unnamed tributary of Trout Creek in El Dorado County, with watershed characteristics (size, geology, vegetation) similar to those of Heavenly Valley Creek. Hidden Valley Creek originates from springs below Freel Peak, approximately 3.5 miles south of the Heavenly Valley Creek watershed. Its watershed area is about 1,162 acres. The LTBMU is monitoring Hidden Valley Creek as a reference stream for its watershed restoration program at the Heavenly Ski Resort.

Water Quality Objectives Not Attained

Numerical water quality objectives for Trout Creek apply upstream to its tributaries. The chloride objectives for Trout Creek are 0.15 milligrams per liter (mg/L) as an annual mean, and 0.20 mg/L as a 90th percentile value.

Evidence of Impairment

Table 2 shows chloride data for Hidden Valley Creek collected by the LTBMU in 1997 and 1998. The water quality objective was violated in both years.

Table 2. Chloride Concentration Data for Hidden Valley Creek

Station	Year	Annual Mean	Range
Hidden Valley Creek (43-H5)	1997	0.4 mg/L	0.1-1.0
Hidden Valley Creek (43-H5)	1998	0.4 mg/L	0.1-1.0

Extent of Impairment

The only available data are for Hidden Valley Creek near its mouth. The entire creek is recommended for listing.

Potential Sources

In comparing chloride data for Heavenly Valley and Hidden Valley Creeks, the LTBMU stated that generally chloride concentrations appear to be lower at the two undeveloped sites, and that chloride is assumed to enter streams through salts in precipitation.

TMDL Priority

This TMDL is recommended for a low priority, with completion projected to occur after 2015. The water quality objective for chloride in Trout Creek is based on limited data collected before 1980. Because the watershed of Hidden Valley Creek is undisturbed, the chloride presumably comes from atmospheric deposition. Chloride at these concentrations is probably not harmful to aquatic life uses. The Regional Board may consider updating chloride objectives for waters of the Lake Tahoe Basin based on current data as an alternative to development of a TMDL.

Information Sources

California Regional Water Quality Control Board, Lahontan Region, 1995. *Water Quality Control Plan for the Lahontan Region.*

California Regional Water Quality Control Board, Lahontan Region, 2001. *Staff Report on Recommended Changes to Lahontan Region's Section 303(d) List of Impaired Surface Water Bodies*.

U.S. Forest Service, Lake Tahoe Basin Management Unit, 1998. *Heavenly Ski Resort 1997 Environmental Monitoring Report.*

U.S. Forest Service, Lake Tahoe Basin Management Unit, 1999. *Heavenly Ski Resort 1998 Environmental Monitoring Report.*

HIDDEN VALLEY CREEK, PHOSPHORUS
2002 Section 303(d) Fact Sheet
Listing

Summary of Proposed Action

Hidden Valley Creek, a tributary of Trout Creek in the Lake Tahoe Basin, is proposed to be listed for phosphorus.

Table 1. 303(d) Listing/TMDL Information

Waterbody Name	Hidden Valley Creek	**Pollutant(s)**	Phosphorus
Hydrologic Unit	Lake Tahoe (634.10)	**Sources**	Natural background, atmospheric deposition
Total Length	2.95 miles	**TMDL Priority**	High
Size Affected	2.95 miles	**TMDL End Date**	After 2015
Latitude/Longitude	38.858^{o}N, 119.899^{o}W	**Original Listing Year**	2002

Watershed Characteristics

"Hidden Valley Creek" is not an official geographic name. It is the name used by U.S. Forest Service, Lake Tahoe Basin Management Unit (LTBMU) staff for an unnamed tributary of Trout Creek in El Dorado County, with watershed characteristics (size, geology, vegetation) similar to those of Heavenly Valley Creek. Hidden Valley Creek originates from springs below Freel Peak, approximately 3.5 miles south of the Heavenly Valley Creek watershed. Its watershed area is about 1,162 acres. The LTBMU is monitoring Hidden Valley Creek as a reference stream for its watershed restoration program at the Heavenly Ski Resort.

Water Quality Objectives Not Attained

Numerical water quality objectives for Trout Creek apply upstream to its tributaries. The total phosphorus objective for Trout Creek is 0.015 milligrams per liter (mg/L) as an annual mean.

Evidence of Impairment

Table 2 summarizes data collected by the LTBMU for total phosphorus in Hidden Valley Creek. Annual means are in violation of the water quality objective in both years.

Table 2. Phosphorus data for Hidden Valley Creek.

Station	Year	Annual Mean (mg/L)	Range (mg/L)
Hidden Valley Creek (43-H5)	1997	0.021	0.012-0.030
Hidden Valley Creek (43-H5)	1998	0.027	0.018-0.048

Extent of Impairment

The entire creek is recommended for listing.

Potential Sources

Since the watershed of Hidden Valley Creek is undisturbed, the phosphorus presumably comes from natural geologic sources and/or from atmospheric deposition (from sources such as road dust, windblown soil, and ash from forest fires, wood stoves, etc.).

TMDL Priority

This TMDL is recommended to be given high priority, but is not projected for completion until after 2015. It may be developed in connection with a phosphorus TMDL for the entire Trout Creek watershed.

Information Sources

California Regional Water Quality Control Board, Lahontan Region, 1995. *Water Quality Control Plan for the Lahontan Region.*

California Regional Water Quality Control Board, Lahontan Region, 2001. *Staff Report on Recommended Changes to Lahontan Region's Section 303(d) List of Impaired Surface Water Bodies.*

Liu, M.S., J.E. Reuter, and C.R. Goldman, 2001. Seasonal Significance of Atmospheric Deposition of Phosphorus and the Sources of Deposition for Lake Tahoe, CA-NV. Abstract of paper presented at meeting of American Society of Limnology and Oceanography, Albuquerque NM, February 2001.

U.S. Forest Service, Lake Tahoe Basin Management Unit, 1998. *Heavenly Ski Resort 1997 Environmental Monitoring Report.*

U.S. Forest Service, Lake Tahoe Basin Management Unit, 1999. *Heavenly Ski Resort 1998 Environmental Monitoring Report.*

GENERAL CREEK, PHOSPHORUS
2002 Section 303(d) Fact Sheet
Listing

Summary of Proposed Action

General Creek, a tributary of Lake Tahoe, is proposed to be added to the Section 303(d) list for violation of the water quality objective for total phosphorus.

Table 1. 303(d) Listing/TMDL Information

Waterbody Name	General Creek	**Pollutant(s)**	Phosphorus
Hydrologic Unit	Lake Tahoe (634.20)	**Sources**	Erosion, atmospheric deposition, stormwater
Total Length	9.17 miles	**TMDL Priority**	High
Size Affected	9.17 miles	**TMDL End Date**	After 2015
Latitude/Longitude	39.055^{o}N, 120.112 ^{o}W	**Original 303(d) Listing Year**	2002

Watershed Characteristics

General Creek, in Placer County, is tributary to Lake Tahoe on its western shore. It has a watershed area of 7.63 square miles and a main channel length of 9.17 miles. Soils are derived mostly from granitic parent materials. The watershed is forested and relatively undisturbed; it is mostly under U.S. Forest Service and California State ownership (Sugar Pine Point State Park). General Creek is used as a "reference stream" in the Lake Tahoe Interagency Monitoring Program. State Highway 89 crosses the lower part of the watershed, and there are developed campground and day use facilities in the State Park.

Water Quality Objectives Not Attained

The numerical water quality objective for total phosphorus in General Creek is 0.015 milligrams per liter (mg/L) as an annual mean.

Evidence of Impairment

Data from the Lake Tahoe Interagency Monitoring Program (LTIMP) summarized by the Tahoe Regional Planning Agency (1999) show that annual mean concentrations of Total Phosphorus in General Creek violated the water quality objective during 12 of 16 water years between Water Years 1981 and 1996. Annual mean values ranged from 0.011 to 0.031 mg/L. Rowe's summary of LTIMP data cited the range of phosphorus concentrations as 0.007 to 0.275 mg/L in General Creek between 1988 and 1996, and the median concentration as 0.021 mg/L.

Extent of Impairment

The entire creek is recommended for listing.

Potential Sources

Although the General Creek watershed is relatively undisturbed, it is not totally "pristine." Sources of phosphorus in the creek may include streambank erosion, road dust, windblown soil from unvegetated campgrounds and day use areas, and ash from forest fires, campfires, and home woodstoves or fireplaces.

TMDL Priority

A high priority ranking is recommended for this TMDL. Phosphorus loading from the General Creek watershed will be addressed in development of the Lake Tahoe phoshorus TMDL. If a more specific TMDL is needed for General Creek, it will be completed after 2015.

Information Sources:

California Regional Water Quality Control Board, Lahontan Region, 1995. *Water Quality Control Plan for the Lahontan Region.*

California Regional Water Quality Control Board, Lahontan Region, 2001. *Staff Report on Recommended Changes to Lahontan Region's Section 303(d) List of Impaired Surface Water Bodies.*

Liu, M.S., J.E. Reuter, and C.R. Goldman, 2001. Seasonal Significance of Atmospheric Deposition of Phosphorus and the Sources of Deposition for Lake Tahoe, CA-NV. Abstract of paper presented at meeting of American Society of Limnology and Oceanography, Albuquerque NM, February 2001.

Murphy, D.M., and C.M. Knopp, editors, 2000. *Lake Tahoe Watershed Assessment.* Gen. Tech. Rep. PSW-GTR-176, USDA Forest Service, Pacific Southwest Research Station, Albany, CA, Vols. I and II.

Rowe, T.G., 2001. Loads and Yields of Suspended Sediment for Selected Watersheds in the Lake Tahoe Basin, California and Nevada. *Proceedings of the Seventh Federal Interagency Sedimentation Conference*, March 25 to 29, 2001, Reno, Nevada.

Rowe, T.G., 1998. *Loads and Yields of Sediment and Nutrients for Selected Watersheds in the Lake Tahoe Basin, California and Nevada.* U.S. Geological Survey, paper presented at Water Quality Monitoring Council 1998 Conference. Available on the Internet: http://204.87.241.11/98proceedings/Papers/50-ROWE.htm.

Tahoe Regional Planning Agency, 1999. *Annual Water Quality Report.*

GENERAL CREEK, IRON
2002 Section 303(d) Fact Sheet
Listing

Summary of Proposed Action

General Creek, a tributary of Lake Tahoe, is proposed to be listed for iron.

Table 1. 303(d) Listing/TMDL Information

Waterbody Name	General Creek	**Pollutant(s)**	Iron
Hydrologic Unit	Lake Tahoe (634.20)	**Sources**	Erosion, stormwater
Total Length	9.17 miles	**TMDL Priority**	Medium
Size Affected	9.17 miles	**TMDL End Date**	After 2015
Latitude/Longitude	39.055^{o}N, 120.112 ^{o}W	**Original 303(d) Listing Year**	2002

Watershed Characteristics

General Creek, in Placer County, is tributary to Lake Tahoe on its western shore. It has a watershed area of 7.63 square miles and a main channel length of 9.17 miles. Soils are derived mostly from granitic parent materials. The watershed is forested and relatively undisturbed; it is mostly under U.S. Forest Service and California State ownership (Sugar Pine Point State Park). General Creek is used as a "reference stream" in the Lake Tahoe Interagency Monitoring Program. State Highway 89 crosses the lower part of the watershed, and there are developed campground and day use facilities in the State Park

Water Quality Objectives Not Attained

The numerical water quality objective for total iron in General Creek is 0.03 milligrams per liter (mg/L).

Evidence of Impairment

As reported by the Tahoe Regional Planning Agency in 1999, the mean annual concentration of total iron measured in General Creek in the Lake Tahoe Interagency Monitoring Program (LTIMP) exceeded the objective during the eight water years when iron was sampled between Water Years 1989 and 1996. Annual mean concentrations ranged from 0.084 mg/L to 0.385 mg/L. Rowe's analysis of LTIMP data cited a range of instantaneous "total bioreactive iron" concentrations in General Creek of 32-7,650 mg/L with a median concentration of 101 mg/L. (Rowe expresses iron concentrations in micrograms per liter [ug/L] in the text of his report, and the use of mg/L in his summary table is probably a typographical error.)

Iron is measured in the LTIMP as "total biologically available iron (BaFe)" or "total bioreactive iron." It is monitored because of its importance as a plant nutrient. Water quality objectives for iron in tributaries of Lake Tahoe were based on limited data collected before 1980 and probably do not reflect natural background concentrations.

Extent of Impairment

The entire creek is proposed for listing.

Potential Sources

Iron is naturally present in soils of the General Creek watershed. Loading of iron to the creek has probably increased over natural background levels due to watershed disturbance.

TMDL Priority

A medium priority is recommended for this TMDL. However, due to other priorities, the TMDL is not projected to be completed until after 2015. Revision of water quality objectives for iron in tributaries of Lake Tahoe may be considered before that date.

Information Sources

California Regional Water Quality Control Board, Lahontan Region, 1995. *Water Quality Control Plan for the Lahontan Region.*

California Regional Water Quality Control Board, Lahontan Region, 2001. *Staff Report on Recommended Changes to Lahontan Region's Section 303(d) List of Impaired Surface Water Bodies.*

Murphy, D.M., and C.M. Knopp, editors, 2000. *Lake Tahoe Watershed Assessment.* Gen. Tech. Rep. PSW-GTR-176, USDA Forest Service, Pacific Southwest Research Station, Albany, CA, Vols. I and II.

Rowe, T.G., 1998. *Loads and Yields of Sediment and Nutrients for Selected Watersheds in the Lake Tahoe Basin, California and Nevada.* U.S. Geological Survey, paper presented at Water Quality Monitoring Council 1998 Conference. Available on the Internet: http://204.87.241.11/98proceedings/Papers/50-ROWE.html.

Rowe, T.G., 2001. Loads and Yields of Suspended Sediment for Selected Watersheds in the Lake Tahoe Basin, California and Nevada. *Proceedings of the Seventh Federal Interagency Sedimentation Conference*, March 25 to 29, 2001, Reno, Nevada.

Tahoe Regional Planning Agency, 1999. *Annual Water Quality Report.*

UPPER TRUCKEE RIVER, PHOSPHORUS
2002 303(d) Fact Sheet
Listing

Summary of Proposed Action

The Upper Truckee River, a tributary to Lake Tahoe, is proposed to be listed for phosphorus.

Table 1. 303(d) Listing/TMDL Information

Waterbody Name	Upper Truckee River	**Pollutant(s)**	Phosphorus
Hydrologic Unit	Lake Tahoe (634.10)	**Sources**	Atmospheric deposition, erosion stormwater, fertilizer, etc.
Total Length	21.5 miles	**TMDL Priority**	High
Size Affected	21.5 miles	**TMDL End Date**	After 2015
Latitude/Longitude	38.942^{o}N, 119.995^{o} W	**Original 303(d) Listing Year**	2002

Watershed Characteristics

The Upper Truckee River is the largest stream tributary to Lake Tahoe in terms of flow and watershed size, and it may be delivering some of the largest nutrient and sediment loads to the lake. The Upper Truckee River watershed, with an area of 56.5 square miles, is almost entirely within El Dorado County; about 3 square miles of the upper watershed is in Alpine County. Land surface elevations range from lake level (about 6,625 feet above sea level) to 10,063 feet at Red Lake Peak. Slopes range from nearly flat at lake level to as much as 50% in the upper elevations. There are 24 tributary streams to the Upper Truckee River. The main tributary drainages to the Upper Truckee River, with watershed areas, are as follows: Grass Lake Creek (6.4 square miles), Angora Creek (5.7 square miles), Echo Creek (5.4 square miles), and Big Meadow Creek (5.1 square miles). Major wetlands include Grass Lake, Osgood Swamp, Truckee Marsh, Benwood Meadow, and Big Meadow. Grass Lake is the largest quaking bog in California. Major lakes in the watershed include Upper and Lower Echo Lakes, and smaller lakes include Dardanelles, Round, Showers, Elbert, Tamarack, Ralston, and Angora Lakes. Most of the watershed is in U.S. Forest Service ownership. The upper reach of the Upper Truckee River, above Christmas Valley, has been recommended for inclusion in the federal Wild and Scenic Rivers system. Water is diverted out of the Lake Tahoe Basin to the American River from Lower Echo Lake.

The Upper Truckee River watershed was severely disturbed in the 19th and early 20th Centuries by logging and grazing, and in the later 20th Century by hydromodification and urban development. The river has been channelized near the South Lake Tahoe airport and near its confluence with Lake Tahoe, and a large portion of the Truckee Marsh near its mouth has been developed as the Tahoe Keys subdivision. The *Lake Tahoe Watershed Assessment* gave the river an Aquatic Ecosystem Rating of “imperiled.”

Water Quality Objectives Not Attained

The numerical water quality objective for total phosphorus for the Upper Truckee River is 0.015 milligrams per liter (mg/L).

Evidence of Impairment

The Tahoe Regional Planning Agency's (1999) summary of data collected in the Lake Tahoe Interagency Monitoring Program (LTIMP) shows that annual mean concentrations of total phosphorus in the Upper Truckee River violated the water quality objective in all 17 water years of sampling between Water Years 1980 and 1996. Rowe's (1998) analysis of LTIMP data collected between 1988 and 1996 shows a range of total phosphorus concentrations between 0.004 and 0.222 mg/L, with a median concentration of 0.30 mg/L. LTIMP data from the U.S. Geological Survey's NWIS database show that the objective was also violated in 1997, 1998, and 1999.

Potential Sources

Potential sources of phosphorus loading to the Upper Truckee River include erosion, stormwater, urban fertilizer use (including use on two golf courses), and the loss of natural filtration capacity due to development and disturbance of wetlands and riparian areas.

TMDL Priority

This TMDL is recommended to be ranked high priority. Phosphorus loading from the Upper Truckee River will be addressed during development of the Lake Tahoe phosphorus TMDL. If needed, a more specific phosphorus TMDL for the Upper Truckee River will be completed after 2015.

Information Sources

California Regional Water Quality Control Board, Lahontan Region, 1995. *Water Quality Control Plan for the Lahontan Region.*

Liu, M.S., J.E. Reuter, and C.R. Goldman, 2001. Seasonal Significance of Atmospheric Deposition of Phosphorus and the Sources of Deposition for Lake Tahoe, CA-NV. Abstract of paper presented at meeting of American Society of Limnology and Oceanography, Albuquerque NM, February 2001.

Murphy, D.M. and C.M. Knopp, editors, 2000. *Lake Tahoe Watershed Assessment.* Gen. Tech. Rep. PSW-GTR-176, USDA Forest Service, Pacific Southwest Research Station, Albany, CA, Vols. I and II.

Rowe, T.G., 1998. *Loads and Yields of Sediment and Nutrients for Selected Watersheds in the Lake Tahoe Basin, California and Nevada.* U.S. Geological Survey, paper presented at Water Quality Monitoring Council 1998 Conference. Available on the Internet: http://204.87.241.11/98proceedings/Papers/50-ROWE.html

Rowe, T.G., and K.K. Allander, 2000. *Surface- and Ground-Water Characteristics in the Upper Truckee River and Trout Creek Watersheds, South Lake Tahoe, California and Nevada, July-December 1996.* U.S. Geological Survey Water-Resources Investigations Report 00-4001. Available on the Internet: <http://water.usgs.gov/pubs/wri/wri004001/>

Tahoe Regional Planning Agency, 1999. *Annual Water Quality Report*.

U.S. Geological Survey, 2001. Water Quality Samples for California, USGS 10336610 Upper Truckee River at South Lake Tahoe Calif. NWIS Database; <http:www.usgs.gov/ca/nwis>

UPPER TRUCKEE RIVER, IRON
2002 303(d) Fact Sheet
Listing

Summary of Proposed Action

The Upper Truckee River, a tributary of Lake Tahoe, is proposed to be listed for iron.

Table 1. 303(d) Listing/TMDL Information

Waterbody Name	Upper Truckee River	**Pollutant(s)**	Iron
Hydrologic Unit	Lake Tahoe (634.10)	**Sources**	Erosion, stormwater
Total Length	21.5 miles	**TMDL Priority**	Medium
Size Affected	21.5 miles	**TMDL End Date**	After 2015
Latitude/Longitude	38.942^{o}N, 119.995^{o} W	**Original 303(d) Listing Year**	2002

Watershed Characteristics

The Upper Truckee River is the largest stream tributary to Lake Tahoe in terms of flow and watershed size, and it may be delivering some of the largest nutrient and sediment loads to the lake. The Upper Truckee River watershed, with an area of 56.5 square miles, is almost entirely within El Dorado County; about 3 square miles of the upper watershed is in Alpine County. Land surface elevations range from lake level (about 6,625 feet above sea level) to 10,063 feet at Red Lake Peak. Slopes range from nearly flat at lake level to as much as 50% in the upper elevations. There are 24 tributary streams to the Upper Truckee River. The main tributary drainages to the Upper Truckee River, with watershed areas, are as follows: Grass Lake Creek (6.4 square miles), Angora Creek (5.7 square miles), Echo Creek (5.4 square miles), and Big Meadow Creek (5.1 square miles). Major wetlands include Grass Lake, Osgood Swamp, Truckee Marsh, Benwood Meadow, and Big Meadow. Grass Lake is the largest quaking bog in California. Major lakes in the watershed include Upper and Lower Echo Lakes, and smaller lakes include Dardanelles, Round, Showers, Elbert, Tamarack, Ralston, and Angora Lakes. Most of the watershed is in U.S. Forest Service ownership. The upper reach of the Upper Truckee River, above Christmas Valley, has been recommended for inclusion in the federal Wild and Scenic Rivers system. Water is diverted out of the Lake Tahoe Basin to the American River from Lower Echo Lake.

The Upper Truckee River watershed was severely disturbed in the 19th and early 20th Centuries by logging and grazing, and in the later 20th Century by hydromodification and urban development. The river has been channelized near the South Lake Tahoe airport and near its confluence with Lake Tahoe, and a large portion of the Truckee Marsh near its mouth has been developed as the Tahoe Keys subdivision. The *Lake Tahoe Watershed Assessment* gave the river an Aquatic Ecosystem Rating of “imperiled.”

Water Quality Objectives Not Attained

The water quality objective for total iron in the Upper Truckee River is 0.03 milligrams per liter (mg/L) as an annual mean.

Evidence of Impairment

The Tahoe Regional Planning Agency's (1999) summary of data from the Lake Tahoe Interagency Monitoring Program shows that annual mean concentrations of total iron in the Upper Truckee River violated the water quality objective during every water year of sampling (Water Year 1989 through Water Year 1996). The highest annual mean concentration was 0.849 mg/L in Water Year 1995. Rowe's (1998) analysis of LTIMP data collected between 1988 shows that the range of "total bioreactive iron" concentrations was 53-4210 mg/L in the Upper Truckee River, with a median value of 394 mg/L. (Rowe expresses iron concentrations in micrograms per liter [ug/L] in the text of his report, and the use of mg/L in his summary table is probably a typographical error.)

Iron is measured in the LTIMP as "total biologically available iron (BaFe)" or "total bioreactive iron." It is monitored because of its importance as a plant nutrient. Water quality objectives for iron in tributaries of Lake Tahoe were based on limited data collected before 1980 and probably do not reflect natural background concentrations.

Extent of Impairment

The entire Upper Truckee River is recommended for listing.

Potential Sources

Iron is naturally present in soils of the Upper Truckee River watershed. Loading of iron to the river has probably increased over natural background levels due to watershed disturbance. Additional iron may be contributed from stormwater.

TMDL Priority

A medium priority is recommended for this TMDL, which is projected for completion after 2015. Revision of water quality objectives for iron in tributaries of Lake Tahoe may be considered before that date.

Information Sources

California Regional Water Quality Control Board, Lahontan Region, 1995. *Water Quality Control Plan for the Lahontan Region.*

California Regional Water Quality Control Board, Lahontan Region, 2001. *Staff Report on Recommended Changes to Lahontan Region's Section 303(d) List of Impaired Surface Water Bodies.*

Rowe, T.G., 1998. *Loads and Yields of Sediment and Nutrients for Selected Watersheds in the Lake Tahoe Basin, California and Nevada.* U.S. Geological Survey, paper presented at Water Quality Monitoring Council 1998 Conference. Available on the Internet: http://204.87.241.11/98proceedings/Papers/50-ROWE.html.

Rowe, T.G., and K.K. Allander, 2000. *Surface- and Ground-Water Characteristics in the Upper Truckee River and Trout Creek Watersheds, South Lake Tahoe, California and Nevada, July-December 1996.* U.S. Geological Survey Water-Resources Investigations Report 00-4001. Available on the Internet: http://water.usgs.gov/pubs/wri/wri004001/.

Tahoe Regional Planning Agency, 1999. *Annual Water Quality Report.*

UPPER TRUCKEE RIVER, PATHOGENS
2002 Section 303(d) Fact Sheet
Listing

Summary of Proposed Action

The segment of the Upper Truckee River upstream of Christmas Valley is proposed to be listed for "pathogens" due to violations of the water quality objective for coliform bacteria. Fecal coliform bacteria in water are indicators of contamination from the feces of warm-blooded animals and of the possible presence of many different kinds of pathogenic microorganisms.

Table 1. 303(d) Listing/TMDL Information

Waterbody Name	Upper Truckee River	**Pollutant(s)**	Pathogens
Hydrologic Unit	Lake Tahoe (634.10)	**Sources**	Livestock, human recreational users, dogs, wildlife.
Total Length	21.5 miles	**TMDL Priority**	High
Size Affected	~9 miles	**TMDL End Date**	After 2015
Latitude/Longitude	38.942°N, 119.995° W	**Original 303(d) Listing Year**	2002

Watershed Characteristics

The Upper Truckee River is the largest stream tributary to Lake Tahoe in terms of flow and watershed size, and it may be delivering some of the largest nutrient and sediment loads to the lake. The Upper Truckee River watershed, with an area of 56.5 square miles, is almost entirely within El Dorado County; about 3 square miles of the upper watershed is in Alpine County. Land surface elevations range from lake level (about 6,625 feet above sea level) to 10,063 feet at Red Lake Peak. Slopes range from nearly flat at lake level to as much as 50% in the upper elevations. There are 24 tributary streams to the Upper Truckee River. The main tributary drainages to the Upper Truckee River, with watershed areas, are as follows: Grass Lake Creek (6.4 square miles), Angora Creek (5.7 square miles), Echo Creek (5.4 square miles), and Big Meadow Creek (5.1 square miles). Major wetlands include Grass Lake, Osgood Swamp, Truckee Marsh, Benwood Meadow, and Big Meadow. Grass Lake is the largest quaking bog in California. Major lakes in the watershed include Upper and Lower Echo Lakes, and smaller lakes include Dardanelles, Round, Showers, Elbert, Tamarack, Ralston, and Angora Lakes. Most of the watershed is in U.S. Forest Service ownership. The upper reach of the Upper Truckee River, above Christmas Valley, has been recommended for inclusion in the federal Wild and Scenic Rivers system. Water is diverted out of the Lake Tahoe Basin to the American River from Lower Echo Lake.

The Upper Truckee River watershed was severely disturbed in the 19th and early 20th Centuries by logging and grazing, and in the later 20th Century by hydromodification and urban development. The river has been channelized near the South Lake Tahoe airport and near its confluence with Lake Tahoe, and a large portion of the Truckee Marsh near its mouth has been developed as the Tahoe Keys subdivision. The *Lake Tahoe Watershed Assessment* gave the river an Aquatic Ecosystem Rating of "imperiled."

The Meiss grazing allotment covers 11,000 acres near the headwaters of the Upper Truckee River. Meiss Meadows, near Carson Pass, has been used for grazing since 1868. Currently up to 200 cow-calf pairs graze the area each year.

Water Quality Objectives Not Attained

The water quality objective for coliform bacteria in surface waters of the Lahontan Basin Plan states:

> *"Waters shall not contain concentrations of coliform organisms attributable to anthropogenic sources, including human and livestock wastes.*
>
> *The fecal coliform concentration during any 30-day period shall not exceed a log mean of 20/100 ml, nor shall more than 10 percent of all samples collected during any 30-day period exceed 40/100 ml."*

The units used in the water quality objective are the numbers of bacterial colonies per 100 milliliters (ml), sometimes referred to as the "Most Probable Number" or MPN. This objective applies to all surface waters of the Lahontan Region.

Evidence of Impairment

Through analysis of data collected in a cooperative U.S. Forest Service/Regional Board monitoring program, Regional Board staff have documented violations of the water quality objective during years of grazing since 1991. Staff's analysis of data collected in the Dardanelles (Meiss) grazing allotment in 1999 when no grazing occurred, and in 2000 when grazing was allowed, showed violations of the water quality objective at two stations during the late grazing season when livestock were present. No violations were found at a third station during either year. Log means of fecal coliform data collected at the Regional Board's Station 1 in upper Christmas Valley in July and August 2001 ranged from 24 to 33 colonies per 100 ml, in violation of the objective. The 40/100 ml limit was also exceeded in September 2001.

Extent of Impairment

The segment proposed for listing extends from the headwaters of the Upper Truckee River to Lahontan Regional Board staff's monitoring Station 1 at Hawley Grade.

TMDL Priority

This TMDL is recommended for high priority because of the resource value of the Upper Truckee River watershed and the potential for human health problems. However, it is recommended for completion after 2015 because of other high priorities. The U.S. Forest Service has made a commitment to control grazing so as to ensure attainment of the standard, and Regional Board staff

have requested that a recreation strategy be developed to reduce the loading of fecal coliform bacteria from other anthropogenic sources. Monitoring will continue, and if the standard is attained, this water body/pollutant combination will be recommended for delisting during a future cycle.

Information Sources

Bourelle, A. 1999. Regulations may force cattle out. *Tahoe Daily Tribune*, November 23, 1999.

California Regional Water Quality Control Board, Lahontan Region, 1975. *Water Quality Control Plan for the North Lahontan Basin.*

California Regional Water Quality Control Board, Lahontan Region, 1995. *Water Quality Control Plan for the Lahontan Region.*

California Regional Water Quality Control Board, Lahontan Region, 2001. Letter dated February 23, 2001, from Lauri Kemper, Chief, Lake Tahoe Watershed Unit, to Maribeth Gustafson, Forest Supervisor, Lake Tahoe Basin Management Unit, "Summary of Fecal Coliform Statistics on Meiss Grazing Allotment-1999 and 2000 Seasons, and Recommendations for 2001 Season."

California Regional Water Quality Control Board, Lahontan Region, 2001. *Staff Report on Recommended Changes to Lahontan Region's Section 303(d) List of Impaired Surface Water Bodies.*

California Regional Water Quality Control Board, Lahontan Region and U.S. Forest Service, Lake Tahoe Basin Management Unit, 2000-2001. Unpublished fecal coliform data for the Upper Truckee River.

BIG MEADOW CREEK, PATHOGENS
2002 Section 303(d) Fact Sheet
Listing

Summary of Proposed Action

A segment of Big Meadow Creek, in the Lake Tahoe Basin, is proposed to be listed for "pathogens" due to violations of the water quality objective for coliform bacteria. Fecal coliform bacteria in water are indicators of contamination from the feces of warm-blooded animals, and of the possible presence of many different kinds of pathogenic microorganisms.

Table 1. 303(d) Listing/TMDL Information

Waterbody Name	Big Meadow Creek	**Pollutant(s)**	Pathogens
Hydrologic Unit	Lake Tahoe (634.10)	**Sources**	livestock, humans, dogs, wildlife, etc.
Total Length	~3.5 miles	**TMDL Priority**	High
Size Affected	~2 miles	**TMDL End Date**	After 2015
Latitude/Longitude	38.779^{o}N, 119.998^{o}W	**Original 303(d) Listing Year**	2002

Watershed Characteristics

Big Meadow Creek is a tributary of the Upper Truckee River, which in turn is tributary to Lake Tahoe. Its watershed area is 5.1 square miles. Most of the watershed is in El Dorado County, but there is one tributary stream with its headwaters in Alpine County. The main creek is about 3.5 miles long. The watershed is mostly forested, but includes a large meadow and smaller riparian/meadow areas. The watershed has been heavily disturbed by historic and recent grazing. It is currently used for dispersed recreation including summer hiking and camping and winter cross-country skiing.

Water Quality Objectives Not Attained

The water quality objective for coliform bacteria in surface waters of the Lahontan Basin Plan states:

> *"Waters shall not contain concentrations of coliform organisms attributable to anthropogenic sources, including human and livestock wastes.*
>
> *The fecal coliform concentration during any 30-day period shall not exceed a log mean of 20/100 ml, nor shall more than 10 percent of all samples collected during any 30-day period exceed 40/100 ml."*

The units used in the water quality objective are the numbers of bacterial colonies per 100 milliliters (ml), sometimes referred to as the "Most Probable Number" or MPN. This objective applies to all surface waters of the Lahontan Region.

Evidence of Impairment

Regional Board staff compared monitoring data from three stations on Big Meadow Creek during 1999 (when grazing occurred) and 2000 (when there was no grazing). At the downstream station, BM-1, there was a nearly 10-fold increase in fecal coliform bacteria during the grazing season. However, the objective was violated four times during the July 16-October 1, 2000 (non-grazing) period, indicating probable influence of horses, hikers, campers, dogs, wildlife, etc.). The middle station, BM-2 showed consistent violations with grazing and no violations without grazing. The upstream station, BM-3, had violations in four out of six samples with grazing, and two out of ten samples without grazing. During the grazing season in 1999, samples collected when livestock were present had violations from 50-70% of the time, while the corresponding period in 2000 had only 0-9% violations. The U.S. Forest Service's raw data for 2001 show that violations of the 40/100 ml objective occurred in August and September.

Extent of Impairment

The segment of Big Meadow Creek proposed for listing extends from the headwaters to just below the U.S.Forest Service foot bridge at lower Big Meadow (U.S. Forest Service monitoring station BM-1).

TMDL Priority

This TMDL is recommended for high priority because of the resource value of the Upper Truckee River watershed and the potential for human health problems. However, it is recommended for completion after 2015 because of other high priorities. The U.S. Forest Service has made a commitment to control grazing so as to ensure attainment of the standard within the Meiss Grazing Allotment, and Regional Board staff have requested that a recreation strategy be developed to reduce the loading of fecal coliform bacteria from other anthropogenic sources. Monitoring will continue, and if the standard is attained, this water body/pollutant combination will be recommended for delisting during a future cycle.

Information Sources

California Regional Water Quality Control Board, Lahontan Region, 1995. *Water Quality Control Plan for the Lahontan Region.*

California Regional Water Quality Control Board, Lahontan Region, 2001. Letter dated February 23, 2001, from Lauri Kemper, Chief, Lake Tahoe Watershed Unit, to Maribeth Gustafson, Forest Supervisor, Lake Tahoe Basin Management Unit, "Summary of Fecal Coliform Statistics on Meiss Grazing Allotment—1999 and 2000 Seasons, and Recommendations for 2001 Season."

California Regional Water Quality Control Board, Lahontan Region, and U.S. Forest Service, Lake Tahoe Basin Management Unit, 2000-2001. Unpublished fecal coliform data for Big Meadow Creek.

California Regional Water Quality Control Board, Lahontan Region, 2001. *Staff Report on Recommended Changes to Lahontan Region's Section 303(d) List of Impaired Surface Water Bodies.*

Rowe, T.G., and K.K. Allander, 2000. *Surface- and Ground-Water Characteristics in the Upper Truckee River and Trout Creek Watersheds, South Lake Tahoe, California and Nevada, July-December 1996.* U.S. Geological Survey Water-Resources Investigations Report 00-4001. Available on the Internet: http://water.usgs.gov/pubs/wri/wri004001/.

TROUT CREEK, PHOSPHORUS
2002 303(d) Fact Sheet
Listing

Summary of Proposed Action

Trout Creek, a tributary of Lake Tahoe, is proposed to be added to the Section 303(d) list for violations of the water quality objective for total phosphorus.

Table 1. 303(d) Listing/TMDL Information

Waterbody Name	Trout Creek	**Pollutant(s)**	Phosphorus
Hydrologic Unit	Lake Tahoe (634.10)	**Sources**	Erosion, stormwater, atmospheric deposition, fertilizer use.
Total Length	10.7 miles	**TMDL Priority**	High
Size Affected	10.7 miles	**TMDL End Date**	After 2015
Latitude/Longitude	39.941^{o}N, 119.996^{o}W	**Original 303(d) Listing Year**	2002

Watershed Characteristics

The Trout Creek watershed is located within El Dorado County, east of the Upper Truckee River watershed. It is the second largest watershed in the Lake Tahoe basin, with an area of 41.2 square miles. Elevation ranges from lake level (about 6225 feet) to 10,811 feet at Freel Peak. Slopes ranges from nearly flat to 50% at higher elevations. Major tributaries with watershed areas include Cold Creek (12.8 square miles), Saxon Creek (8.2 square miles), Heavenly Valley Creek (3.0 square miles), and Hidden Valley Creek (1.7 square miles). Major wetlands include the Truckee Marsh, High Meadows, and Hell Hole. The only lake in this watershed is Star Lake.

The Trout Creek watershed has been disturbed by historic logging and livestock grazing, ski resort development in the Heavenly Valley Creek watershed, and urban development near Lake Tahoe. The watershed includes a closed municipal landfill, older subdivisions which formerly used septic systems, an area formerly used for land disposal of secondary effluent, and the current South Tahoe Public Utility District wastewater treatment plant and storage facilities.

Water Quality Objectives Not Attained

The water quality objective for total phosphorus in Trout Creek is 0.015 milligrams per liter (mg/L) as an annual mean.

Evidence of Violation

Annual mean phosphorus concentrations for Trout Creek from Lake Tahoe Interagency Monitoring Program (LTIMP) data violated the water quality objectives in all 14 of the water years between 1980 and 1996 during which Trout Creek was sampled. (Data are summarized in the Tahoe Regional Planning Agency's Annual Report.) Rowe's (1998) analysis of LTIMP data collected between 1988 and 1996 shows a range in concentration from 0.003 to 0.393 mg/L, with a median value of 0.041 mg/L.

Extent of Violation

The entire creek is proposed for listing.

Potential Sources

The major sources of phosphorus in the Trout Creek watershed are probably erosion, stormwater and atmospheric deposition, and fertilizer use. Development and disturbance of wetlands and riparian areas in the Trout Creek watershed has reduced their former natural filtering capacity for nutrients and probably increased phosphorus loading to Lake Tahoe.

TMDL Priority

This TMDL is recommended for a high priority ranking. Phosphorus loading from the Trout Creek watershed will be addressed during development of the Lake Tahoe phoshorus TMDL. If a more specific TMDL for Trout Creek is needed, it will be completed after 2015.

Information Sources

California Regional Water Quality Control Board, Lahontan Region, 1995. *Water Quality Control Plan for the Lahontan Region.*

California Regional Water Quality Control Board, Lahontan Region, 2001. *Staff Report on Recommended Changes to Lahontan Region's Section 303(d) List of Impaired Surface Water Bodies.*

Liu, M.S., J.E. Reuter, and C.R. Goldman, 2001. Seasonal Significance of Atmospheric Deposition of Phosphorus and the Sources of Deposition for Lake Tahoe, CA-NV. Abstract of paper presented at meeting of American Society of Limnology and Oceanography, Albuquerque NM, February 2001.

Murphy, D.M., and C.M. Knopp, editors, 2000. *Lake Tahoe Watershed Assessment.* Gen. Tech. Rep. PSW-GTR-176, USDA Forest Service, Pacific Southwest Research Station, Albany, CA, Vols. I and II.

Rowe, T.G., 1998. *Loads and Yields of Sediment and Nutrients for Selected Watersheds in the Lake Tahoe Basin, California and Nevada.* U.S. Geological Survey, paper presented at Water Quality Monitoring Council 1998 Conference. Available on the Internet: <http://204.87.241.11/98proceedings/Papers/50-ROWE.html>

Rowe, T.G., and K.K. Allander, 2000. *Surface- and Ground-Water Characteristics in the Upper Truckee River and Trout Creek Watersheds, South Lake Tahoe, California and Nevada, July-December 1996.* U.S. Geological Survey Water-Resources Investigations Report 00-4001. Available on the Internet: <http://water.usgs.gov/pubs/wri/wri004001/>

Tahoe Regional Planning Agency, 1999. *Annual Water Quality Report.*

TROUT CREEK, NITROGEN
2002 303(d) Fact Sheet
Listing

Summary of Proposed Action

Trout Creek, a tributary of Lake Tahoe, is proposed to be added to the Section 303(d) list due to violation of the water quality objective for total nitrogen.

Table 1. 303(d) Listing/TMDL Information

Waterbody Name	Trout Creek	**Pollutant(s)**	Nitrogen
Hydrologic Unit	Lake Tahoe (634.10)	**Sources**	Erosion, stormwater, atmospheric deposition, fertilizer use
Total Length	10.7 miles	**TMDL Priority**	High
Size Affected	10.7 miles	**TMDL End Date**	After 2015
Latitude/Longitude	39.941^{o}N, 119.996^{o}W	**Original 303(d) Listing Year**	2002

Watershed Characteristics

The Trout Creek watershed is located within El Dorado County, east of the Upper Truckee River watershed. It is the second largest watershed in the Lake Tahoe basin with an area of 41.2 square miles. Elevation ranges from lake level (about 6225 feet) to 10,811 feet at Freel Peak. Slopes range from nearly flat to 50 percent at higher elevations. Major tributaries with watershed areas include Cold Creek (12.8 square miles), Saxon Creek (8.2 square miles), Heavenly Valley Creek (3.0 square miles), and Hidden Valley Creek (1.7 square miles). Major wetlands include the Truckee Marsh, High Meadows, and Hell Hole. The only lake in this watershed is Star Lake.

The Trout Creek watershed has been disturbed by historic logging and livestock grazing, ski resort development in the Heavenly Valley Creek watershed, and urban development near Lake Tahoe. The watershed includes a closed municipal landfill, older subdivisions which formerly used septic systems, an area formerly used for land disposal of secondary effluent, and the current South Tahoe Public Utility District wastewater treatment plant and storage facilities.

Water Quality Objectives Not Attained

The water quality objective for total nitrogen in Trout Creek is 0.19 milligrams per liter (mg/L) as an annual mean.

Evidence of Impairment

Lake Tahoe Interagency Monitoring Program (LTIMP) data summarized by the Tahoe Regional Planning Agency (1999) show that annual mean concentrations of total nitrogen in Trout Creek were in violation of the water quality objective during six of the 8 water years of sampling between 1989 and 1996. The highest annual mean value reported was 0.275 mg/L during Water Year 1995. Rowe (1998) summarized LTIMP data separately for total ammonia plus organic nitrogen

and for dissolved nitrate plus nitrite, for the period between 1998 and 1996. During that time, the concentration of total ammonia plus organic nitrogen in Trout Creek ranged from 0.02 to 2.1 mg/L with a median value of 0.21 mg/L, and dissolved nitrate plus nitrate ranged from 0.002 to 0.060 mg/L with a median value of 0.008 mg/L.

Extent of Impairment

The entire creek is recommended for listing.

Potential Sources

Nitrogen in the Trout Creek watershed comes from natural sources such as nitrogen fixation by plants, and from anthropogenic sources including atmospheric deposition, urban stormwater and fertilizer use, past livestock grazing, and past septic system use and wastewater disposal to land.

TMDL Priority

A high priority is recommended for this TMDL. Nitrogen loading from the Trout Creek watershed will be addressed during the development of the Lake Tahoe nitrogen TMDL. If a more specific nitrogen TMDL for Trout Creek is needed, it will be completed after 2015.

Information Sources

California Regional Water Quality Control Board, Lahontan Region, 1995. *Water Quality Control Plan for the Lahontan Region.*

California Regional Water Quality Control Board, Lahontan Region, 2001. *Staff Report on Recommended Changes to Lahontan Region's Section 303(d) List of Impaired Surface Water Bodies.*

Murphy, D.M., and C.M. Knopp, editors, 2000. *Lake Tahoe Watershed Assessment.* Gen. Tech. Rep. PSW-GTR-176, USDA Forest Service, Pacific Southwest Research Station, Albany, CA, Vols. I and II.

Rowe, T.G., 1998. *Loads and Yields of Sediment and Nutrients for Selected Watersheds in the Lake Tahoe Basin, California and Nevada.* U.S. Geological Survey, paper presented at Water Quality Monitoring Council 1998 Conference. Available on the Internet: http://204.87.241.11/98proceedings/Papers/50-ROWE.html.

Rowe, T.G., and K.K. Allander, 2000. *Surface- and Ground-Water Characteristics in the Upper Truckee River and Trout Creek Watersheds, South Lake Tahoe, California and Nevada, July-December 1996.* U.S. Geological Survey Water-Resources Investigations Report 00-4001. Available on the Internet: http://water.usgs.gov/pubs/wri/wri004001/.

Tahoe Regional Planning Agency, 1999. *Annual Water Quality Report.*

TROUT CREEK, IRON
2002 303(d) Fact Sheet
Listing

Summary of Proposed Action

Trout Creek, a tributary of Lake Tahoe, is proposed to be listed for violation of the water quality objective for total iron.

Table 1. 303(d) Listing/TMDL Information

Waterbody Name	Trout Creek	**Pollutant(s)**	Iron
Hydrologic Unit	Lake Tahoe (634.10)	**Sources**	Erosion, stormwater, atmospheric deposition
Total Length	10.7 miles	**TMDL Priority**	Medium
Size Affected	10.7 miles	**TMDL End Date**	After 2015
Latitude/Longitude	39.941^{o}N, 119.996^{o}W	**Original 303(d) Listing Year**	2002

Watershed Characteristics

The Trout Creek watershed is located within El Dorado County, east of the Upper Truckee River watershed. It is the second largest watershed in the Lake Tahoe basin with an area of 41.2 square miles. Elevation ranges from lake level (about 6225 feet) to 10,811 feet at Freel Peak. Slopes range from nearly flat to 50 percent at higher elevations. Major tributaries with watershed areas include Cold Creek (12.8 square miles), Saxon Creek (8.2 square miles), Heavenly Valley Creek (3.0 square miles), and Hidden Valley Creek (1.7 square miles). Major wetlands include the Truckee Marsh, High Meadows, and Hell Hole. The only lake in this watershed is Star Lake.

The Trout Creek watershed has been disturbed by historic logging and livestock grazing, ski resort development in the Heavenly Valley Creek watershed, and urban development near Lake Tahoe. The watershed includes a closed municipal landfill, older subdivisions which formerly used septic systems, an area formerly used for land disposal of secondary effluent, and the current South Tahoe Public Utility District wastewater treatment plant and storage facilities.

Water Quality Objectives Not Attained

The water quality objective for total iron in Trout Creek is 0.03 milligrams per liter (mg/L) as an annual mean.

Evidence for Impairment

Data from the Lake Tahoe Interagency Monitoring Program (LTIMP) summarized by the Tahoe Regional Planning Agency (TRPA) in 1999 show that annual average concentrations of total iron from Trout Creek violated the water quality objective every year between Water Years 1989 and 1996. Rowe's (1998) analysis of LTIMP data reported "total bioreactive iron" concentrations ranging from 137 to 8,750 mg/L in Trout Creek between 1988 and 1996, with a median value of 620 mg/L. (Rowe expresses iron concentrations in micrograms per liter [ug/L] in the text of his report, and the use of mg/L in his summary table is probably a typographical error.)

Iron is measured in the LTIMP as "total biologically available iron (BaFe)" or "total bioreactive iron." It is monitored because of its importance as a plant nutrient. Water quality objectives for iron in tributaries of Lake Tahoe were based on limited data collected before 1980 and probably do not reflect natural background concentrations.

Extent of Impairment

The entire creek is recommended for listing.

Potential Sources

Iron is naturally present in soils of the Trout Creek watershed. Loading of iron to the creek has probably increased over natural background levels due to increases in erosion and stormwater runoff.

TMDL Priority

A medium priority is recommended for this TMDL, which is projected for completion after 2015. Revision of water quality objectives for iron in tributaries of Lake Tahoe may be considered before that date.

Information Sources

California Regional Water Quality Control Board, Lahontan Region, 2001. *Water Quality Control Plan for the Lahontan Region.*

California Regional Water Quality Control Board, Lahontan Region, 2001. *Staff Report on Recommended Changes to Lahontan Region's Section 303(d) List of Impaired Surface Water Bodies.*

Murphy, D.M., and C.M. Knopp, editors, 2000. *Lake Tahoe Watershed Assessment.* Gen. Tech. Rep. PSW-GTR-176, USDA Forest Service, Pacific Southwest Research Station, Albany, CA, Vols. I and II.

Rowe, T.G., 1998. *Loads and Yields of Sediment and Nutrients for Selected Watersheds in the Lake Tahoe Basin, California and Nevada.* U.S. Geological Survey, paper presented at Water Quality Monitoring Council 1998 Conference. Available on the Internet: http://204.87.241.11/98proceedings/Papers/50-ROWE.html

Rowe, T.G., and K.K. Allander, 2000. *Surface- and Ground-Water Characteristics in the Upper Truckee River and Trout Creek Watersheds, South Lake Tahoe, California and Nevada, July-December 1996.* U.S. Geological Survey Water-Resources Investigations Report 00-4001. Available on the Internet: <http://water.usgs.gov/pubs/wri/wri004001/>

Tahoe Regional Planning Agency, 1999. *Annual Water Quality Report.*

TROUT CREEK, PATHOGENS
2002 Section 303(d) Fact Sheet
Listing

Summary of Proposed Action

A one-mile segment of Trout Creek is proposed to be listed for "pathogens" due to violations of the water quality objective for coliform bacteria. Fecal coliform bacteria in water are indicators of contamination from the feces of warm-blooded animals and of the possible presence of many different kinds of pathogenic microorganisms.

Table 1. 303(d) Listing/TMDL Information

Waterbody Name	Trout Creek	**Pollutant(s)**	Pathogens
Hydrologic Unit	Lake Tahoe (634.10)	**Sources**	livestock, humans, dogs, wildlife, etc.
Total Length	10.7 miles	**TMDL Priority**	High
Size Affected	~ 1 mile	**TMDL End Date**	After 2015
Latitude/Longitude	39.941^{o}N, 119.996^{o}W	**Original 303(d) Listing Year**	2002

Watershed Characteristics

The Trout Creek watershed is located within El Dorado County, east of the Upper Truckee River watershed. It is the second largest watershed in the Lake Tahoe basin with an area of 41.2 square miles. Elevation ranges from lake level (about 6225 feet) to 10,811 feet at Freel Peak. Slopes range from nearly flat to 50 percent at higher elevations. Major tributaries with watershed areas include Cold Creek (12.8 square miles), Saxon Creek (8.2 square miles), Heavenly Valley Creek (3.0 square miles), and Hidden Valley Creek (1.7 square miles). Major wetlands include the Truckee Marsh, High Meadows, and Hell Hole. The only lake in this watershed is Star Lake.

The Trout Creek watershed has been disturbed by historic logging and livestock grazing, ski resort development in the Heavenly Valley Creek watershed, and urban development near Lake Tahoe. The watershed includes a closed municipal landfill, older subdivisions which formerly used septic systems, an area formerly used for land disposal of secondary effluent, and the current South Tahoe Public Utility District wastewater treatment plant and storage facilities.

Water Quality Objectives Not Attained

The water quality objective for coliform bacteria in surface waters of the Lahontan Basin Plan states:

> *"Waters shall not contain concentrations of coliform organisms attributable to anthropogenic sources, including human and livestock wastes.*
>
> *The fecal coliform concentration during any 30-day period shall not exceed a log mean of 20/100 ml, nor shall more than 10 percent of all samples collected during any 30-day period exceed 40/100 ml."*

The units used in the water quality objective are the numbers of bacterial colonies per 100 milliliters (ml), sometimes referred to as the "Most Probable Number" or MPN. This objective applies to all surface waters of the Lahontan Region.

Evidence of Impairment

At Regional Board Station 7, "Trout Creek at Highway 50," one samples exceeded the 20/100 ml log mean objective in June 2001, and all samples exceeded this objective in July 2001. The 40/100 ml objective was exceeded in every month between June and September, 2001.

At Regional Board Station 10, "Lower Trout Creek", the 20/100 ml log mean objective was exceeded in July 2001. The 40/100 ml objective was exceeded in July and August.

Violations of both objectives were also documented in 2000.

Extent of Impairment

The segment of Trout Creek proposed for listing extends downstream from the Highway 50 bridge in South Lake Tahoe to the creek's confluence with the Upper Truckee River/Lake Tahoe backwater, and is about one mile long..

Potential Sources

Livestock wastes are probably the major source of fecal coliform bacteria. Other possible sources include wildlife, pets, and human (transient or recreational) users of the Trout Creek meadow.

TMDL Priority

This TMDL is recommended for a high priority with completion projected to occur after 2015.

Information Sources

California Regional Water Quality Control Board, Lahontan Region, 1995. *Water Quality Control Plan for the Lahontan Region.*

California Regional Water Quality Control Board, Lahontan Region, 2000-2001. Unpublished fecal coliform data for Trout Creek

California Regional Water Quality Control Board, Lahontan Region, 2001. *Staff Report on Recommended Changes to Lahontan Region's Section 303(d) List of Impaired Surface Water Bodies.*

Rowe, T.G., and K.K. Allander, 2000. *Surface- and Ground-Water Characteristics in the Upper Truckee River and Trout Creek Watersheds, South Lake Tahoe, California and Nevada, July-December 1996.* U.S. Geological Survey Water-Resources Investigations Report 00-4001. Available on the Internet: http://water.usgs.gov/pubs/wri/wri004001/.

TALLAC CREEK, PATHOGENS
2002 Section 303(d) Fact Sheet
Listing

Summary of Proposed Action

A segment of Tallac Creek, a tributary of Lake Tahoe, is proposed to be listed for "pathogens" due to violations of the narrative water quality objective for fecal coliform bacteria. Fecal coliform bacteria in water are indicators of contamination from the feces of warm-blooded animals and of the possible presence of many different kinds of pathogenic microorganisms.

Table 1. 303(d) Listing/TMDL Information

Waterbody Name	Tallac Creek	**Pollutant(s)**	Pathogens
Hydrologic Unit	Lake Tahoe (634.10)	**Sources**	Livestock, human recreational users, pets, wildlife
Total Length	~3 miles	**TMDL Priority**	High
Size Affected	~0.5 mile	**TMDL End Date**	After 2015
Latitude/Longitude	38.941^{o}N, 120.058^{o}W	**Original 303(d) Listing Year**	2002

Watershed Characteristics

Tallac Creek originates in the Desolation Wilderness on the slopes of Mount Tallac, and flows into Lake Tahoe in the Baldwin Beach area. The watershed area is 2932 acres. Tallac Creek has two small tributary streams, and Floating Island Lake is located within its watershed. The U.S. Forest Service Baldwin Grazing Allotment is located on 210 acres along lower Tallac Creek near the Baldwin and Ski Beach recreation areas. The allotment supports grazing by 50 horses and mules from Cascade Stables between July 1 and September 1. The Tallac Creek watershed also includes the U.S. Forest Service Spring Creek summer home tract.

Water Quality Objectives Not Attained

The narrative water quality objective for fecal coliform bacteria in the Lahontan Basin Plan states:

> *"Waters shall not contain concentrations of coliform organisms attributable to anthropogenic sources, including human and livestock wastes.*
>
> *The fecal coliform concentration during any 30-day period shall not exceed a log mean of 20/100 ml, nor shall more than 10 percent of all samples collected during any 30-day period exceed 40/100 ml."*

The units used in the water quality objective are the numbers of bacterial colonies per 100 milliliters (ml), sometimes referred to as the "Most Probable Number" or MPN. This objective applies to all surface waters of the Lahontan Region.

Evidence of Impairment

Extent of Impairment

The reach of Tallac Creek proposed for listing extends downstream from the Highway 89 bridge (U.S. Forest Service monitoring station B-2) to Lake Tahoe (below U.S.Forest Service station B-1).

Potential Sources

Livestock wastes are probably the major sources of fecal coliform loading to the segment of Tallac Creek proposed for listing. Wildlife, human recreational users of the watershed and their pets are other possible sources.

TMDL Priority

This TMDL is recommended for a high priority, with completion projected to occur after 2015.

Information Sources

California Regional Water Quality Control Board, Lahontan Region, 1995. *Water Quality Control Plan for the Lahontan Region.*

California Regional Water Quality Control Board, Lahontan Region and U.S. Forest Service, Lake Tahoe Basin Management Unit, 2000-2001. Unpublished fecal coliform data for Tallac Creek..

California Regional Water Quality Control Board, Lahontan Region, 2001. *Staff Report on Recommended Changes to Lahontan Region's Section 303(d) List of Impaired Surface Water Bodies.*

U.S. Forest Service, Lake Tahoe Basin Management Unit, 2001. Wildlife/Range Management. Available on the Internet: www.r5.fs.fed.us/ltbmu/management/wildlife/range

WARD CREEK, NITROGEN
2002 Section 303(d) Fact Sheet
Listing

Summary of Proposed Action

Ward Creek, a tributary of Lake Tahoe, is currently listed for sediment. An additional listing for nitrogen is proposed.

Table 1. 303(d) Listing/TMDL Information

Waterbody Name	Ward Creek	**Pollutant(s)**	Nitrogen
Hydrologic Unit	Lake Tahoe (634.20)	**Sources**	Erosion, stormwater, atmospheric deposition
Total Length	5.90 miles	**TMDL Priority**	High
Size Affected	5.90 miles	**TMDL End Date**	After 2015
Latitude/Longitude	39.120^{o} N, 120.154 ^{o}W	**Original 303(d) Listing Year**	2002

Watershed Characteristics

Ward Creek, in Placer County, is tributary to Lake Tahoe on its western shore, near the community of Sunnyside. It has one tributary stream. Ward Creek has a watershed area of 9.75 square miles and a main channel length of 5.90 miles. Its average annual runoff between 1993 and 1996 was 23,200 acre-feet; the average annual mean daily streamflow for this period was 32.1 cubic feet per second. In addition to the development near its mouth, the Alpine Peaks subdivision and roads and lifts from the Alpine Meadows ski resort are located in Ward Creek's upper watershed. It is one of the streams which has received long term sampling under the Lake Tahoe Interagency Monitoring Program (LTIMP), and it has been the site of a number of University of California, Davis Tahoe Research Group research projects.

Water Quality Objectives Not Attained

The water quality objective for total nitrogen in Ward Creek is 0.15 mg/L (milligrams per liter) as an annual mean.

Evidence of Impairment

The Tahoe Regional Planning Agency's (1999) summary of data from the LTIMP shows that annual mean concentrations of total nitrogen in Ward Creek exceeded the water quality objective in seven of eight water years between Water Years 1989 and 1996. Rowe (1998) also analyzed LTIMP data collected between 1988 and 1996. He found that "total ammonia plus organic nitrogen" (total Kjeldahl nitrogen) concentrations in Ward Creek ranged from 0.2-1.2 mg/L with a median concentration of 0.12 mg/L, and "dissolved nitrite plus nitrate" ranged from 0.001 to 0.072 mg/L with a median concentration of 0.010 mg/L. Rowe's analysis of mean daily yields of nitrogen showed Ward Creek to have the highest total Kjeldahl nitrogen yield of the ten LTIMP streams studied.

Extent of Impairment

The entire creek is recommended for listing.

Potential Sources

Nitrogen in Ward Creek probably comes from natural sources such as nitrogen fixation, and from atmospheric deposition, erosion, and stormwater.

TMDL Priority

A high priority is recommended for the Ward Creek nitrogen TMDL. Nitrogen loading from the Ward Creek watershed will be addressed as part of the Lake Tahoe nitrogen TMDL. If a more specific TMDL is needed for Ward Creek, it will be completed after 2015.

Information Sources

California Regional Water Quality Control Board, Lahontan Region, 2001. *Water Quality Control Plan for the Lahontan Region.*

California Regional Water Quality Control Board, Lahontan Region, 2001. *Staff Report on Recommended Changes to Lahontan Region's Section 303(d) List of Impaired Surface Water Bodies.*

Murphy, D.M., and C.M. Knopp, editors, 2000. *Lake Tahoe Watershed Assessment.* Gen. Tech. Rep. PSW-GTR-176, USDA Forest Service, Pacific Southwest Research Station, Albany, CA, Vols. I and II.

Rowe, T.G., 1998. *Loads and Yields of Sediment and Nutrients for Selected Watersheds in the Lake Tahoe Basin, California and Nevada.* U.S. Geological Survey, paper presented at Water Quality Monitoring Council 1998 Conference. Available on the Internet: http://204.87.241.11/98proceedings/Papers/50-ROWE.html.

Tahoe Regional Planning Agency, 1999. *Annual Water Quality Report.*

WARD CREEK, PHOSPHORUS
2002 303(d) Fact Sheet
Listing

Summary of Proposed Action.

Ward Creek, a tributary of Lake Tahoe, is proposed to be added to the Section 303(d) List for violations of the water quality objective for Total Phosphorus.

Table 1. 303(d) Listing/TMDL Information

Waterbody Name	Ward Creek	**Pollutant(s)**	Phosphorus
Hydrologic Unit	Lake Tahoe (634.20)	**Sources**	Erosion, atmospheric deposition
Total Length	5.90 miles	**TMDL Priority**	High
Size Affected	5.90 miles	**TMDL End Date**	After 2015
Latitude/Longitude	39.120^{o} N, 120.154 ^{o}W	**Original 303(d) Listing Year**	2002

Watershed Characteristics

Ward Creek, in Placer County, is tributary to Lake Tahoe on its northwestern shore, near the community of Sunnyside. It has one tributary stream. Ward Creek has a watershed area of 9.75 square miles and a main channel length of 5.90 miles. Its average annual runoff between 1993 and 1996 was 23,200 acre-feet; the average annual mean daily streamflow for this period was 32.1 cubic feet per second. In addition to the development near its mouth, the Alpine Peaks subdivision and roads and lifts from the Alpine Meadows ski resort are located in Ward Creek's upper watershed. The Ward Creek watershed has been disturbed by past logging and grazing. It is one of the streams which has received long term sampling under the Lake Tahoe Interagency Monitoring Program (LTIMP), and has been the site of a number of University of California, Davis Tahoe Research Group research projects.

Water Quality Objectives Not Attained

The numerical water quality objective for total phosphorus in Ward Creek is 0.015 milligrams per liter (mg/L), as an annual mean.

Evidence of Impairment

A summary of data from the LTIMP by the Tahoe Regional Planning Agency (1999) shows that concentrations of total phosphorus in Ward Creek violated the water quality objective in 15 of 17 water years between Water Years 1980 and 1996. Rowe's (1998) analysis of LTIMP data collected between 1988 and 1996 showed that phosphorus concentrations in Ward Creek ranged from 0.008 mg/L to 20.02 mg/L, with a median value of 0.032.

Extent of Impairment

The entire creek is recommended for listing.

Potential Sources

Phosphorus in the Ward Creek watershed is probably associated largely with eroded sediment, but may also come from atmospheric deposition, from sources such as wood ash and windblown dust. Erosion from streambanks and from the "badlands" area near the headwaters of Ward Creek has been cited as a significant sediment source; the University of California, Davis Tahoe Research Group is conducting research to identify source areas more precisely.

TMDL Priority

A high priority is recommended for the Ward Creek phosphorus TMDL. Nutrient loading from the Ward Creek watershed to will be addressed as part of the Lake Tahoe phosphorus TMDL. If a more specific TMDL is needed for Ward Creek, it will be completed after 2015.

Information Sources

California Regional Water Quality Control Board, Lahontan Region, 2001. *Water Quality Control Plan for the Lahontan Region.*

California Regional Water Quality Control Board, Lahontan Region, 2001. *Staff Report on Recommended Changes to Lahontan Region's Section 303(d) List of Impaired Surface Water Bodies.*

Liu, M.S., J.E. Reuter, and C.R. Goldman, 2001. Seasonal Significance of Atmospheric Deposition of Phosphorus and the Sources of Deposition for Lake Tahoe, CA-NV. Abstract of paper presented at meeting of American Society of Limnology and Oceanography, Albuquerque NM, February 2001.

Rowe, T.G., 1998. *Loads and Yields of Sediment and Nutrients for Selected Watersheds in the Lake Tahoe Basin, California and Nevada.* U.S. Geological Survey, paper presented at Water Quality Monitoring Council 1998 Conference. Available on the Internet: http://204.87.241.11/98proceedings/Papers/50-ROWE.html.

Tahoe Regional Planning Agency, 1999. *Annual Water Quality Report.*

WARD CREEK, IRON
2002 Section 303(d) Fact Sheet
Listing

Summary of Proposed Action

Ward Creek, a tributary of Lake Tahoe, is proposed to be listed for violations of the water quality objective for total iron.

Table 1. 303(d) Listing/TMDL Information

Waterbody Name	Ward Creek	**Pollutant(s)**	Iron
Hydrologic Unit	Lake Tahoe (634.20)	**Sources**	Erosion, stormwater
Total Length	5.90 miles	**TMDL Priority**	Medium
Size Affected	5.90 miles	**TMDL End Date**	After 2015
Latitude/Longitude	39.120^{o} N, 120.154 ^{o}W	**Original 303(d) Listing Year**	2002

Watershed Characteristics

Ward Creek, in Placer County, is tributary to Lake Tahoe on its northwest shore, near the community of Sunnyside. It has one tributary stream. Ward Creek has a watershed area of 9.75 square miles and a main channel length of 5.90 miles. Its average annual runoff between 1993 and 1996 was 23,200 acre-feet; the average annual mean daily streamflow for this period was 32.1 cubic feet per second. In addition to the development near its mouth, the Alpine Peaks subdivision and roads and lifts from the Alpine Meadows ski resort are located in Ward Creek's upper watershed. It is one of the streams which has received long term sampling under the Lake Tahoe Interagency Monitoring Program (LTIMP), and has been the site of a number of University of California, Davis Tahoe Research Group research projects.

Water Quality Objectives Not Attained

The numerical water quality objective for total iron in Ward Creek is 0.03 milligrams per liter (mg/L), annual mean.

Evidence of Impairment

The Tahoe Regional Planning Agency's (1999) summary of data from the LTIMP shows that annual mean concentrations of total iron exceeded the water quality objective during every water year from Water Year 1989 to 1996. The highest annual mean concentration was 1.690 mg/L in Water Year 1996. Rowe's (1998) analysis of LTIMP data collected between 1988 and 1996 showed that instantaneous concentrations of total bioreactive iron ranged from 8 mg/L to 33,900 mg/L in Ward Creek, with a median concentration of 159 mg/L. (Rowe expresses iron concentrations in micrograms per liter [ug/L] in the text of his report, and the use of mg/L in his summary table is probably a typographical error.)

Iron is measured in the LTIMP as "total biologically available iron (BaFe)" or "total bioreactive iron." It is monitored because of its importance as a plant nutrient. Water quality objectives for iron in tributaries of Lake Tahoe were based on limited data collected before 1980 and probably do not reflect natural background concentrations.

Extent of Impairment

The entire creek is recommended for listing.

Potential Sources

Iron is naturally present in soils of the Ward Creek watershed. Loading of iron to the creek has probably increased over natural background levels due to watershed disturbance.

TMDL Priority

A medium priority is recommended for this TMDL, which is projected for completion after 2015. Revision of water quality objectives for iron in tributaries of Lake Tahoe may be considered before that date.

Information Sources

California Regional Water Quality Control Board, Lahontan Region, 2001. *Water Quality Control Plan for the Lahontan Region.*

California Regional Water Quality Control Board, Lahontan Region, 2001. *Staff Report on Recommended Changes to Lahontan Region's Section 303(d) List of Impaired Surface Water Bodies.*

Murphy, D.M., and C.M. Knopp, editors, 2000. *Lake Tahoe Watershed Assessment.* Gen. Tech. Rep. PSW-GTR-176, USDA Forest Service, Pacific Southwest Research Station, Albany, CA, Vols. I and II.

Rowe, T.G., 1998. *Loads and Yields of Sediment and Nutrients for Selected Watersheds in the Lake Tahoe Basin, California and Nevada.* U.S. Geological Survey, paper presented at Water Quality Monitoring Council 1998 Conference. Available on the Internet: http://204.87.241.11/98proceedings/Papers/50-ROWE.html.

Tahoe Regional Planning Agency, 1999. *Annual Water Quality Report.*